

EXHIBIT A



United States Department of the Interior

FISH AND WILDLIFE SERVICE
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Consultation # 02ETAU00-2019-F-1895

Dear Messrs. Mobley and McMahan:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (BO) based on our review of Project Numbers SWF-2018-00227 and SWG-2018-00737, Permian Highway Pipeline (PHP) within the U.S. Army Corps of Engineers (Corps, USACE) Fort Worth and Galveston districts, and its effects on the federally endangered golden-cheeked warbler (*Setophaga* [= *Dendroica*] *chrysoparia*), Houston toad (*Bufo houstonensis*), and the federally threatened Tobusch fishhook cactus (*Sclerocactus brevihamatus* ssp. *tobuschii*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 531 et seq.; Act). We also provide our concurrence with the Corps' determination that the proposed action may affect, but is not likely to adversely affect the Austin blind salamander (*Eurycea waterlooensis*) and Barton Springs salamander (*Eurycea sosorum*). Given there are two Corps district offices involved in this consultation, the Corps has elected to assign this project two separate project numbers; SWF-2018-00227 for the Fort Worth District and SWG-2018-00737 for the Galveston District. Although the Corps has assigned two separate project numbers, the Service will evaluate the information in its entirety as a single project spanning two Corps districts within this BO. The Corps' Fort Worth and Galveston districts' requests for formal consultation were received September 18, 2019, and September 24, 2019, respectively.

This BO is based on information provided in the August 2019, Biological Assessment (BA) for the PHP within the Corps' Fort Worth and Galveston districts, interagency meetings and discussions, Service files, and other sources of information. A complete administrative record of this consultation is on file in the Service's Austin Ecological Services Field Office (ESFO). The Corps has determined that the proposed action may affect, and is likely to adversely affect golden-cheeked warbler, Houston toad, and Tobusch fishhook cactus; and may affect, and is not likely to adversely affect Austin blind salamander and Barton Springs salamander.

Informal Consultation

The Service concurs with the Corps' determination that the proposed action may affect, and is not likely to adversely affect the Austin blind salamander and Barton Springs salamander. Our concurrence is based on information from: 1) the BA to include Appendix B and Figure 4; 2) the karst survey report titled "Results of the Karst Terrain Feature Survey for the Proposed Permian Highway Pipeline Project, Central Texas" (Cambrian 2019a); 3) pertinent information about the Barton Springs segment of the Edwards Aquifer; 4) the January 16, 2020, e-mail from the Corps requesting to informally consult on the Austin blind salamander; and 5) other information that is available to us.

The PHP will occur along the southern boundary of the Barton Springs segment of the Edwards Aquifer for approximately 12 miles (pipeline mile posts 329.5 to 341.5). Nearly all of this approximately 12-mile length of the proposed pipeline will be within the recharge zone of the Edwards Aquifer near the groundwater divide which separates the Barton Springs and San Antonio segments of the Edwards Aquifer. The Applicant considered an analysis area that bounds the 12-mile segment with a 984-foot distance perpendicular from the construction area boundary on either side of the pipeline. The 984-foot distance is based on the Service's designation of critical habitat for the Austin blind salamander (*Eurycea waterlooensis*) and Jollyville plateau salamander (*Eurycea tonkawae*) (78 FR 51327). The Applicant conducted surveys for karst features with a potential to contribute recharge to occupied salamander sites by using the 984-foot distance to delineate their karst feature survey area. In other words, the Applicant surveyed for karst features that were 984 feet from the project area. The Austin Blind salamander, Jollyville Plateau salamander, and the Barton Springs salamander are related species in the genus *Eurycea* with similar life histories and resource needs; all three species live in respective segments of the Edwards Aquifer. The Austin Blind and Barton Springs salamanders may be found within the Barton Springs Segment, while the Jollyville Plateau salamander may be found in the Northern Segment of the Edwards Aquifer. The proposed action is not located within the Northern Segment of the Edwards Aquifer. In the critical habitat designation, we explained that 984 feet represents the approximate distance between the farthest two spring outlets known at the time to be occupied by the Austin blind salamander, therefore; this distance captures the extent to which salamander populations exist through the underground habitat that were detectable at the time of the critical habitat designation.

A sensitive feature is defined by Texas Commission on Environmental Quality (TCEQ) as a permeable geologic or artificial feature located on the recharge zone or transition zone where there is a potential for hydraulic interconnectedness between the surface and the Edwards Aquifer and rapid infiltration to the subsurface may occur (Title 30, Texas Administrative Code, and Section 213.3 (29)). The Applicant conducted a karst feature survey in the analysis area from February to July, 2019 (Cambrian 2019a), in accordance with TCEQ'S Edwards Aquifer Protection Program and the Service's guidance for conducting presence/absence surveys for endangered karst invertebrates. The Applicant surveyed a 35-mile long segment of the proposed project that includes 23 miles in the Trinity Aquifer recharge zone and 12 miles in the Barton Springs Segment of the Edwards Aquifer.

Surveyors located 150 individual natural geologic and anthropogenic karst features within the 35-mile survey area (approximately 8,349 acres). Of these, 41 are identified as recharge features

in the Barton Springs Segment, including streambed fractures, small caves, sinkholes, and large upland sinkholes. One of the identified recharge features, Bull Pasture Sink, has been shown through dye trace studies to be hydrologically connected to Barton Springs, a spring complex occupied by both the Austin blind and Barton Springs salamanders (Smith et al. 2012, Zappitello et al. 2018). Twelve of the 41 recharge features in the action area are considered by us to be sensitive recharge features either because Cambrian (2019a) reported them as sensitive, or we concluded they were sensitive based on the information provided in the Cambrian report. Five sensitive recharge features are within the construction area, and none are within the project centerline. Sensitive recharge features within the construction area include features: 739-001, and 739-018; 740-006A and 740-006B; and 742-002 (Cambrian 2019a). The Applicant rerouted the pipeline to increase the distance between these features and construction activities. The increased distance does not remove the proposed project from each features' drainage basin, but does increase the buffer distance and reduces the amount of disturbance within respective drainage basins reducing potential for erosion that could cause sediment to enter the aquifer through these features.

The Barton Springs Complex is the cluster of springs located in Austin, Texas, that is inhabited by the Austin blind and Barton Springs salamanders (collectively referred to as "salamanders" herein). This spring complex is approximately 18.4 miles from the proposed project. Barton Springs salamanders have been found at sites away from the Barton Springs Complex, while Austin blind salamanders have not. The nearest documented Barton Springs salamander location from the PHP is approximately five miles away at Stuart Spring in Little Bear Creek (Devitt and Nissan 2018). With the exception of Barton Springs, it is unknown if there is subsurface connection between sensitive features in the PHP project area and other occupied Barton Springs salamander sites.

Evaluation of Construction Activities

Potential harm, in the form of killing or injuring, due to crushing associated with construction activities to these salamanders is not anticipated to occur as there are no known occupied salamander sites within the limits of construction. Potential harm to salamanders at locations geographically removed from the proposed project due to degradation of habitat in the form of reduced water quality resulting from construction activities, is expected to be insignificant (i.e. not meaningfully measured, detected, or evaluated). Our reasoning is explained below.

The pipeline's alignment was moved farther away from sensitive features, and the proposed project will be completed in accordance with avoidance and minimization measures detailed in the Void Response and Mitigation Measures (Appendix C of the BA), which is consistent with TCEQ's Edwards Aquifer Protection Program and Edwards Aquifer Rules. The Applicant's void mitigation and water quality measures avoid and minimize potential for contaminants and sediments to enter and degrade water quality within the Barton Springs Segment of the Edwards Aquifer. If any voids are encountered during project construction, the Applicant will follow their Void Response and Mitigation measures to ensure potential water quality degradation is avoided or minimized. Although the PHP is not subject to the TCEQ's Edwards Aquifer Rules, these rules have been incorporated into the proposed action as avoidance and minimization measures to ensure aquifer protection and consistency with other projects to which the rules apply. The Applicant will not use horizontal directional drilling (HDD) in the recharge zone of the Edwards

Aquifer; thus avoiding the need for pilot holes (or excessive pilot holes in the event of hole abandonment) and the potential to contaminate groundwater sources with drilling fluids used in the HDD process.

Evaluation of Operation and Maintenance

Potential harm to salamanders at locations geographically removed from the proposed project due to degradation of habitat in the form of reduced water quality resulting from operation and maintenance activities is expected to be discountable (i.e. extremely unlikely to occur). This includes any potential for accumulation and leakage of liquefied hydrocarbon products (i.e. condensate) or catastrophic failure of the pipeline (i.e. explosion). During the PHP's operational phase, only dry natural gas will be transported in the pipeline. The PHP will not be used to transport liquid hydrocarbons (SWCA 2019, Cambrian 2019b). The Applicant will take all necessary measures to avoid accumulation of liquids and condensate; thus avoiding any potential contamination due to leaks within the recharge zone of the Edwards Aquifer. These measures include the: 1) use of measurement stations equipped with chromatographs and analyzers to ensure pipeline contents are in gaseous form only; 2) ability to remotely interrupt service if gas quality specifications are not met; and 3) use of a cryogenic gas plant which will remove condensate. Dry natural gas has a dew point of negative 90 degrees Fahrenheit (Cambrian 2019b). At temperatures above minus 90 degrees Fahrenheit and at ambient air pressure, natural gas remains in a gas state. Ground temperatures within the action area range between 60 and 70 degrees Fahrenheit on average; thus avoiding accumulation of condensate or causing a change from a gas to a liquid state.

Conclusion

Determining connection between a sensitive recharge feature and a salamander-occupied site is difficult because subterranean flow pathways are not visible and do not necessarily follow surface contours. Given subsurface hydrogeological uncertainties, the Corps will require the Applicant to implement water quality conservation measures to avoid or minimize potential negative consequences to the Austin blind salamander and Barton Springs salamander due to water quality degradation. These conservation measures are detailed in the BA in Table 4.2.1 and Appendix C. The Applicant will implement their Void Response and Mitigation Measures, which details the procedures for implementing void detection and temporary protection, void characterization, void mitigation measures, and post-installation inspection. The Void Response and Mitigation Measures are based on the TCEQ Edwards Aquifer Protection Program and Edwards Aquifer Rules (Title 30 Texas Administrative Code Chapter 213).

Based on the information provided within the BA, implementation of conservation measures detailed in Table 4.2.1 and Appendix C, and other information available to us, the Service anticipates any negative consequences to the Austin blind and Barton Springs salamanders due to project construction and operation will be insignificant and discountable.

The Corps has determined the proposed project will have no effect on 28 other threatened or endangered species discussed in Table 11 of the BA. In this BO we evaluate the effects of the proposed action on the golden-cheeked warbler (GCWA), Houston toad, and the Tobusch fishhook cactus (TFHC).

CONSULTATION HISTORY

August 2, 2018	Pre-application meeting held with the Corps' Fort Worth District, the Applicant, and the Service to discuss the project.
June 25, 2019	The Service received the BA from the Corps' Fort Worth District requesting formal consultation for the GCWA, and TFHC, and informal consultation for the Barton springs salamander.
July 23, 2019	The Service requests additional information from the Corps and Applicant for the BA dated June 2019.
September 18, 2019	The Service receives the revised BA from the Corps' Fort Worth District and request for consultation for the GCWA, and TFHC, and informal consultation for the Barton Springs salamander.
September 24, 2019	The Service receives the revised BA from the Corps' Galveston District and request for consultation for the Houston toad. The Service considers all information complete and initiates consultation with the Corps' Fort Worth and Galveston districts.
January 6, 2020	Draft biological opinion provided to the USACE and the Applicant.
January 16, 2020	The Service receives the Corps' and the Applicant's combined comments on the draft biological opinion. The Corps requests informal consultation on the Austin blind salamander.
January 31, 2020	The Service submits the final biological opinion to the Corps.

BIOLOGICAL OPINION

I. DESCRIPTION OF THE PROPOSED ACTION

As defined in the Act's section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

Section 404 of the Clean Water Act (CWA, 33 U.S.C. § 1251 et seq.; Federal Water Pollution Control Act, as amended), through the Corps, regulates the discharge of dredged or fill material into the Waters of the United States (WOTUS), including wetlands. The Corps has notified the Service that their Applicant, Permian Highway Pipeline, LLC (PHP, Applicant), will be seeking verification of authorization of certain impacts to WOTUS under Nationwide Permit (NWP) 12 for Utility Lines. Therefore, the Corps is the federal agency associated with this formal consultation. Section 7 of the Act requires that all federal agencies consult with the Service to ensure that the actions authorized, funded, or carried out by such agencies do not jeopardize the

continued existence of any threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat of such species.

Pursuant to the Act's section 7 implementing regulations, even though the Corps has jurisdiction over a small extent of the overall PHP project, potential consequences to species must be considered for the entire pipeline. This is because under the Act and the regulations implementing section 7, the effects of the action include all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action if it would not occur but for the proposed action and is reasonably certain to occur. The agencies have worked together to develop an approach that recognizes the Corps' limited jurisdiction, while satisfying the requirements of section 7 of the Act and the applicable regulations. Specifically, Service memorandum FWS/AES/DER066893 dated November 3, 2017, discusses an agreement in principle between the Service and the Corps regarding this type of circumstance. The Service's letter FWS/AES/065732 dated May 22, 2017, and its enclosure, "Process for Section 7 Consultation in Small Federal Handle Situations", provides guidance addressing these situations. The letter addresses projects where Corps involvement is limited to making a permitting decision for a small component of a larger project, a general approach which the agencies then tailor to suit the particular situation as appropriate.

This memorandum is not novel or a departure, but rather is consistent with the Service's longstanding and oft-used practice of (1) analyzing the full effects of agency actions under section 7 of the Act, including effects from private development that occur on non-federal land outside of the federal action agency's jurisdiction where that development is reasonably certain to occur and would not occur but for the agency action, and (2) including any resulting take from such development in the incidental take statement of the section 7 biological opinion. The memorandum is also fully consistent with section 7 of the Act, which at multiple points expressly recognizes that private or non-federal "applicants" for a federal permit or license required for a private project or other activity may be involved in the section 7 consultation process associated with the federal permit or license and may obtain an exemption for incidental take of listed species caused by the private project through that section 7 consultation process (see 16 U.S.C. 1536(a)(3), (b)(1)(B), (3)(A), (4)(C), o(2)).

In addition, in the recent revisions to the Act's section 7 consultation regulations, the Service recognized these kinds of situations where a federal action agency does not have jurisdiction over the full extent of a project enabled by a federal permit or license and stated that:

When the Services write an incidental take statement for a biological opinion, under section 7(b)(4)(iv) of the ESA they can assign responsibility of specific terms and conditions of the incidental take statement to the Federal action agency, the applicant, or both taking into account their respective roles, authorities, and responsibilities. The Services have worked with Federal action agencies in the past, and will continue to do so into the future, to ensure that a reasonable and prudent measure assigned to a Federal action agency does not exceed the scope of a Federal action agency's authority (84 FR 44977).

Therefore, the BA submitted by the Corps considers the entirety of the project for purposes of the Act, but is based on a recognition of “USACE Action Areas” versus “Applicant Action Areas.” With respect to “Applicant Action Areas,” reasonable and prudent measures will be assigned to the Applicant and the Corps will defer to the Service for any compliance or enforcement needs and the Applicant will report directly to the Service, with a copy to the Corps, for that purpose.

The Service’s interagency cooperation regulations, therefore, further support the approach established in the agencies’ agreement in principle (84 FR 44976).

The following is a summary of the proposed action for purposes of compliance with the Act. A detailed description can be found in the August 2019, Biological Assessment for the PHP within the U.S. Army Corps of Engineers Fort Worth and Galveston districts, SWF-2018-00227 and SWG-2018-00737, respectively. The Corps proposes verifying that NWP 12 would authorize discharges of dredge or fill material into WOTUS in certain areas necessary for the construction of the PHP. The proposed natural gas pipeline will be approximately 428.54 miles long and will extend from the Waha Interconnect in Reeves County, Texas, to the delivery point in Colorado County, Texas (Figure 1). The pipeline will consist of a 42-inch outer diameter natural gas pipeline that will be constructed primarily by conventional trenching methods. Horizontal directional drilling (HDD) or horizontal bore (HB) construction methods will be used to avoid significant environmental or physical features to include river crossings at the Llano, James, Pedernales, Blanco, and Navidad rivers; one unnamed waterway associated with the Blanco River; and major roads to include Interstate Highway 35, State Highway 130, and Interstate 10.

Most access roads needed for construction of the pipeline are existing facilities on private lands or are existing public roads. Pipeline construction will require a total of 0.7 acre of improvements to portions of five private access roads. The project will also require the construction and operation of a variety of ancillary facilities and sites associated with the pipeline to include 4 compressor stations, 4 meter stations, 22 valves sites, and 18 other surface sites. Bulldozers, track hoes, and conventional bore and directional drilling/boring equipment will be used. Construction is expected to begin after completion of section 7 consultation and issuance of the Corps’ verifications, as needed, and to take approximately one year to complete.

Action Area

The action area is defined as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action” (50 CFR 402.02).

The project area spans from west to east Texas and includes the Edwards Plateau, Texas Blackland Prairie, and the East Central Texas Plains ecoregions. The PHP will cross 16 Texas counties to include: Reeves, Pecos, Crane, Upton, Reagan, Crockett, Schleicher, Menard, Kimble, Gillespie, Blanco, Hays, Caldwell, Gonzales, Lavaca, and Colorado counties (Figure 1). To define the action area for the project, we first discuss the Project Workspaces, Analysis Area, USACE Action Area, and the Applicant Action Area as detailed within the BA. The action area for this project is defined after the aforementioned components are discussed below. For an aerial depiction of delineated Project Workspaces, Project Analysis Area, USACE Action Areas,

and the Applicant Action Area, reference Appendix B of the August 2019 BA. Figure 2 depicts the analysis framework used to define the action area.

Figure 1. Location and alignment of the proposed PHP as it extends from Reeves County in west Texas to Colorado County in southeast Texas.

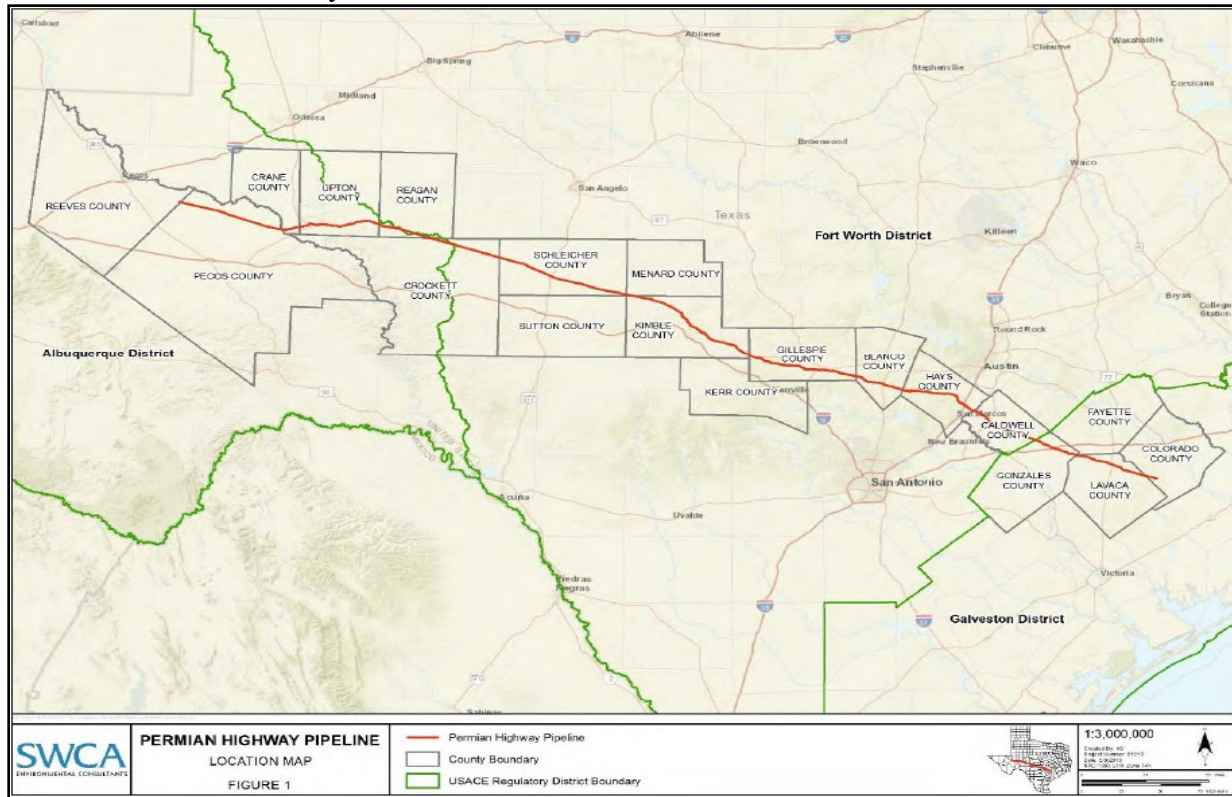
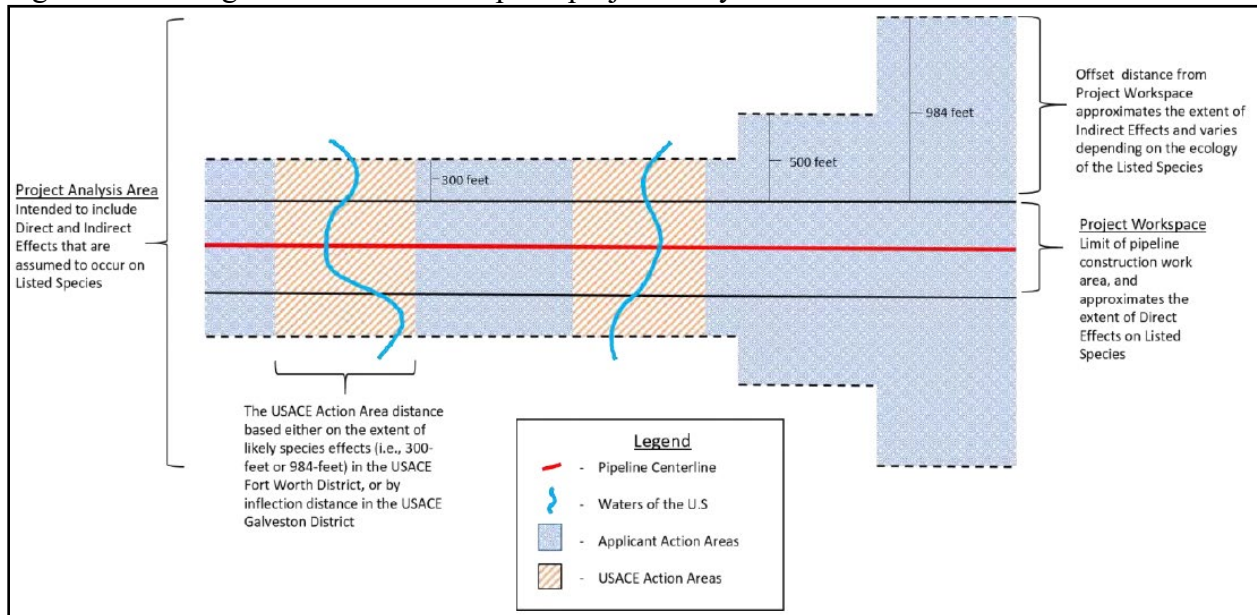


Figure 2. This figure shows the conceptual project analysis framework.



1. *Project Workspaces*: This is the area where permanent and temporary workspaces will occur as part of the entire pipeline construction, including those in the jurisdiction of the Corps' Albuquerque District. Project workspace width will vary depending on the existing environmental conditions throughout various portions of the project. The typical project workspace width within the pipeline right-of-way (ROW) is 125 feet, and is comprised of a 50-foot permanent easement, and a 75-foot temporary construction easement. Project workspace width will vary from "typical" depending on whether pipeline construction is occurring in environmentally sensitive areas, agricultural areas, or areas that will require additional temporary workspaces at certain project locations. In areas associated with potential habitat for the Houston toad the temporary construction easement width will be reduced to 50 feet for a total ROW width of 100 feet. In agricultural areas an additional 25 feet of temporary construction easement would be used for topsoil segregation for a total of 200 feet. Additional temporary workspaces of 25 feet or 50 feet will also be needed to accommodate certain construction activities such as HDD and HB, and at areas such as conventional water crossings, railroad and road crossings, and abrupt points of intersect. Total acreage of Project Workspaces per Corps districts are: Albuquerque (1,810 acres), Fort Worth (4,463.9 acres), and Galveston (930.5 acres).
2. *Project Analysis Area*: The Project Analysis Area encompasses the entirety of the project within the Corps' Fort Worth and Galveston districts regulatory boundaries, and includes Project Workspaces, and the areas where negative impacts to listed species and their federally designated critical habitat may occur. This analysis area varies in width depending on the ecology of the listed species that the project may affect, and resulted in the widths of the Project Analysis Area considering that ecology. These offsets begin where the project workspace ends on either side of the pipeline and vary from 300-foot, 500-foot, and 984-foot offsets for the GCWA and TFHC, Houston toad, and the salamanders, respectively. Total acreage of Project Analysis Area per Corps districts are: Fort Worth (26,375.3 acres), and Galveston (5,939.4 acres).
3. *USACE Action Area*: The USACE Action Area consists of those portions of the action area under the Corps regulatory control due to impacts to WOTUS, and are limited to those sections of the project where NWP 12 is required and NWP General Condition 18, Endangered Species, is triggered. Condition 18 is triggered in the USACE Action Area where pipeline activities requiring Corps permitting may affect federally listed species. Therefore, the USACE Action Area is limited to those particular portions of the project where both NWP 12 authorization is required and Condition 18 is triggered as a result. In those locations defined as USACE Action Areas, the Corps' regulatory boundary distance is based either on the extent of the likely species effects in the Corps' Ft. Worth District and inflection distance in the Corps' Galveston District. Total acreage of USACE Action Area per Corps districts are: Fort Worth (1,204.3 acres), and Galveston (923.7 acres).
4. *Applicant Action Area*: The Applicant Action Area are those portions of the action area that are not under Corps regulation and responsibility, but where the project would not occur but for the proposed verification of NWP 12 for Corps crossings along the proposed alignment. The Applicant Action Area includes uplands, WOTUS crossings not requiring authorization by the Corps due to avoidance by HDD or HB, or do not trigger General Condition 18 due to

no listed species or designated critical habitat being affected. But for the issuance of NWP 12 verifications for the portions of the project outside of the Corps' regulatory boundary, the project as a whole would not occur. Therefore, the Applicants Action Area is included in the Service's defined action area for this project. Given that the Applicant Action Area is outside of the Corps' Action Area, it is the Applicant's responsibility for addressing effects to listed species or designated critical habitat that occur in Applicant Action Areas. Total acreage of Applicant Action Area is 30,186.7 acres for the proposed project.

The Service has determined that the action area for this project is the 32,314.7 acres consistent with the defined Project Analysis Area as described above within the limits of the Corps' Fort Worth and Galveston districts. The portion of the pipeline within the Corps' Albuquerque District is not included within the action area given the non-reporting authorization of NWP 12 does not trigger Condition 18, i.e., the Corps determined that there are no effects on listed species from the project in the Albuquerque District. Therefore, only the portion of the pipeline within the Corps' Fort Worth and Galveston districts is discussed and analyzed herein.

Conservation Measures

The Applicant will implement the following general and species specific conservation measures to avoid and minimize the effects of the project on the Austin blind salamander, Barton Springs salamander, GCWA, Houston toad, and TFHC. These measures will be applied in the relevant portions of the Corps' Action Area and the Applicant Action Areas. For the TFHC, the Applicant has reached a working agreement with Angelo State University, in which Angelo State University will implement a portion of the voluntary measures for the TFHC and are described below. The conservation measures are considered as part of the proposed project and are conditions associated with project authorization under NWP 12.

General Conservation Measures

1. *Herbicide Applications:* The Applicant will apply all herbicides and pesticides within Project Workspaces by hand (i.e., aerial or broadcast application will not be used).
2. *Spill Prevention and Response:* The Applicant will inspect field equipment and vehicles daily for signs of fuel or hydraulic leaks and will repair any such leaks promptly. The Applicant will ensure that its contractors have on-site access to emergency spill kits capable of addressing small releases of petroleum products or other hazardous materials (e.g., small fuel or hydraulic fluid spills from vehicles or equipment). In the unlikely and unexpected event of a major spill of petroleum products or other hazardous materials, the Applicant will promptly obtain the services of a specialized contractor to contain and remediate the affected area.

Additionally, no refueling or maintenance of equipment will be allowed within 100 feet of a waterbody or within a USACE Action Area, whichever distance is greater, unless the refueling or maintenance is associate with a stationary construction activity such as HDD locations or hydrostatic testing locations. When HDD equipment needs to be refueled or maintained, the Applicant will ensure that: 1) an inspector is on site to monitor the activity; 2) appropriate spill containment equipment is on site; 3) all spills are contained and cleaned up immediately; and 4) all spills will be reported, as appropriate. Further, there will be no

storage of fuels or lubricants within any USACE Action Area or within 100 feet of a waterbody, whichever distance is greater.

If dewatering equipment, such as water pumps, are needed in USACE Action Areas or in habitat areas for listed species, the Applicant will ensure that: 1) an inspector is on site to monitor the activity; 2) appropriate spill containment equipment is on site; 3) all spills are contained and cleaned up immediately; 4) all spills will be reported, as appropriate; and 5) all pumps will be staged in secondary containment.

Environmental training will be provided by the Applicant to field personnel performing work related to the proposed project. The Applicant and field personnel will discuss refueling and maintenance activities. Signage will be installed to identify the entry and exit of all USACE Action Areas or when within 100 feet of a waterbody, whichever distance is greater, where refueling and maintenance restrictions apply.

3. *HDD Inadvertent Return Mitigation Plan:* Prior to the start of any HDD activities, the Applicant will prepare an HDD inadvertent Return Mitigation Plan. The Applicant will implement the plan in the unlikely and unexpected event of an inadvertent return during an HDD. The Applicant will notify the Service of any inadvertent return or major spill. The Applicant would also meet the requirements of NWP 12 in such circumstances.
4. *Environmental Awareness Training:* The Applicant will ensure that all field personnel performing work related to the proposed project receive the appropriate environmental awareness training, particular to their job description, prior to starting such work that includes general information about the identification and habitats of the GCWA, Barton Springs salamander, Houston toad, and TFHC, and the Applicant-proposed conservation measures described herein. Further, these same topics will be included in pre-job meetings to be held with the contractors.

Barton Springs Salamander and Austin Blind Salamander Conservation Measures

1. *Horizontal Directional Drilling:* The Applicant will not use horizontal directional drilling construction methods within the recharge zone of the Edwards Aquifer.
2. *Void and Groundwater Mitigation:* Appendix C of the BA contains the Void Response and Mitigation Measures for the PHP which describes measures to be implemented within the range of potential effects to the Austin blind and Barton Springs salamanders. The plan discusses the following:
 - A) Void detection and temporary protection
 - B) Void characterization
 - C) Void mitigation measures
 - D) Post-installation inspection

Golden-cheeked Warbler Conservation Measures

1. *Habitat Protection:* The Applicant has purchased 1,363 acres near Lago Vista in Travis County, Texas (a tract known locally as the "Igau Ranch") for the conservation of the

GCWA, and to minimize impacts due to consequences of the proposed project. The Applicant will transfer ownership of the Igau Ranch to the Service as an addition to the Balcones Canyonlands National Wildlife Refuge (Refuge) within six months of issuance of the Corps' authorization. The Igau Ranch contains high quality GCWA habitat that is occupied by the species and is surround on three sides by Refuge property, and acquisition of the Igau Ranch will contribute to the Refuge's goal of protecting 46,000 acres for long-term conservation of the GCWA and other species native to the Refuge (Service 2001, 2019b). The primary recovery strategy for the GCWA is the establishment of at least one sustainable GCWA population in each of 8 recovery regions or units (Service 1992), where each population has sufficient habitat protected to provide for a carrying capacity of at least 3,000 GCWA breeding pairs (Service 1996).

2. *Seasonal Restrictions:* The Applicant will avoid clearing potential GCWA breeding habitat from Project Workspaces during the GCWA breeding season (March 1 through July 31). The Applicant may perform other construction activities adjacent to potential GCWA breeding habitat during the GCWA breeding season. However, to the extent practicable, the Applicant will perform construction activities in these adjacent areas before March 1, thereby creating a continuous activity that began before the start of the breeding season. In addition to construction and clearing activities, the Applicant will avoid, to the extent practicable, completing operational and maintenance activities (i.e., vegetation maintenance of 50-foot permanent right-of-way) during the GCWA breeding season that may have the potential to affect the species. These seasonal restrictions do not apply to areas that are more than 300 feet away from potential GCWA habitat.
3. *Oak Wilt Prevention:* The Applicant will direct its contractors to follow the Texas Forest Service's or professional arborist's guidelines for the prevention of oak wilt within Project Workspaces in Kimble, Gillespie, Blanco, and Hays Counties. The Applicant will avoid, to the extent practicable, wounding (e.g., cutting, trimming, and pruning) oak trees from February through June. The least hazardous periods for trimming are during the coldest days in midwinter and extended hot periods in mid-to late summer. Regardless of season, all trimming cuts or other wounds to oak trees, including freshly-cut stumps and damaged surface roots, will be treated immediately with a wound or latex paint to prevent exposure to contaminated insect vectors.

Houston Toad Conservation Measures

1. Before clearing, a minimum of one exhaustive pre-clearing search of the construction ROW within Houston toad habitat will occur. During the searches, permitted Houston toad monitors will clear the construction ROW of as much debris as possible to remove sheltering habitat utilized by the Houston toad after overnight dispersal events. Areas where removal of large debris will be required by use of equipment will also be identified during the initial pre-clearing search. Larger debris requiring equipment for removal will be removed (if possible) during a subsequent search of the construction ROW before clearing begins. An additional search of the construction ROW will occur concurrently (same day) with clearing operations to search for Houston toad individuals and remove any large debris not capable of being removed during the initial searches.

2. Concurrent with tree clearing, PHP will install silt fencing along the edges of the project construction corridor to serve as continuous exclusionary barriers to Houston toads. The fencing will be buried 12 inches deep with at least 24 inches above ground and will be maintained for the duration of construction through the demobilization from restoration activities. Additionally, toad gates will be installed at all entrances and exits to the construction corridor to prevent any entrance by the species to the work area.
3. Drive-over toad gates will be used at ingress/egress locations and they will remain in place and functioning through the completion of construction and restoration activities. Gate entrances will remain closed except during vehicle entrance and exit.
4. Once installed, exclusionary fencing will be visually inspected daily until completion of restoration activities. Upon completion of restoration activities all exclusionary fencing will be removed and disposed of properly. Houston toad monitors will inspect the silt fence daily, or more often following heavy rain or wind events, to enable notification to the contractor, construction crews, and PHP. If the fence is down or damaged, the fence will be reestablished or repaired and Houston toad monitors will be notified and given the opportunity to conduct a new survey sweep of the impacted ROW area.
5. While clearing, trenching, burying pipe, and revegetating, the Applicant will deploy at least one Houston toad monitor who is Service permitted to find, capture, and transport Houston toads.
6. Houston toad monitors will provide daily site surveys and inspections during the preparation and pipe installation period within potential Houston toad habitat.
7. Houston toad monitors and/or contractors will install cover boards and/or bucket traps within the ROW for Houston toads approximately every 500 feet in suitable Houston toad habitat.
8. All open trenches will be inspected each morning prior to any work in that area to ensure that no Houston toads have become trapped within the open trench.
9. After rain events with 2 inches or more rainfall in a 48 hour period in the ROW, the Applicant will dispatch additional Houston toad monitors to search for Houston toads in the ROW before work resumes. The additional Houston toad monitors will be utilized for 24 hours following the rain event. Additionally, the Service will be notified when the additional monitors are deployed.
10. The Applicant will reduce pipeline construction ROW disturbance areas through potential Houston toad habitat to 100-foot wide, with additional temporary workspaces as needed. During installation of the pipeline, mechanized tree clearing will be kept to the minimum amount practicable and will be conducted after June 30th but before December 31st. Service concurrence will be necessary if activities need to occur outside of this time frame.
11. Where tree root removal is not required, trees will be cut at ground level leaving root balls intact.

12. Houston toad monitors will observe all clearing operations at a safe distance ahead of the machinery, enabling the potential for detection of the species when moving on the ground as a result of the disturbance.
13. Vegetation debris will be hauled off to areas outside of potential Houston toad habitat or mulched and left in place less than 2 inches thick to provide soil remediation. However, the mulch that is left in place cannot inhibit revegetation of the ROW. The Applicant will determine the amount of mulch that can remain.
14. After the pipeline becomes operational, the Applicant will retain a 50-foot wide permanent ROW through potential Houston toad habitat. Over HDD locations, the ROW will not be disturbed, except for the placement of a tracking system where tree clearing will be avoided.
15. To minimize impacts to the Houston toad, the mowing regime for the ROW will maintain a 12-inch height and the ROW will only be mowed bi-annually. The bi-annual mowing will occur between September and December of any given year. If the conditions are too dry and pose a fire or other safety hazard, mowing should be postponed until conditions allow for safe mowing. The Applicant will retain the right to enter the property to remove brush and trees growing on the permanent ROW that pose a threat to the pipe.
16. All herbicide and pesticide applications will be by hand. Broadcast or aerial applications will not be used.
17. Revegetation will consist of native plant species only. The Applicant will manage for a 70 percent vegetative cover after the second growing season post-construction. The Applicant will commit to establishing 70 percent revegetation before suspending revegetation efforts. In areas where landowners refuse to revegetate with native plants, the Applicant will leave the area unvegetated.
18. All construction personnel, field operations personnel, and supervisors of the PHP project working in suitable Houston toad habitat will receive awareness training on the proper protocol to follow should a Houston toad be identified during construction. This training will be conducted by a permitted Houston toad monitor, and will be completed before the crews begin work. Any subsequently hired or newly deployed personnel will receive this training prior to beginning work in suitable Houston toad habitat. A log of such training will be maintained by the Applicant for the duration of the project and made available to the Service upon request.
19. All Houston toad operations and activities conducted by Houston toad monitors will be supervised by an individual or individuals holding an Endangered Species Act Section 10(a)(1)(A) scientific permit.
20. Upon the identification of Houston toads, all construction activities will cease in the immediate vicinity until a permitted Houston toad monitor is notified.

21. The Applicant will notify by telephone the Service's Texas Coastal ESFO if a Houston toad is discovered. A follow-up email will be sent to Mike Letson, Permitting Compliance Lead, Kinder Morgan, Michael_Letson@kindermorgan.com, 832-799-4759. The Service will provide input on how to proceed with toad capture and relocation.
22. Upon discovery of any injured Houston toad, the individual will be immediately transported to a veterinarian facility for appropriate veterinary care. The Applicant has identified Kyle Animal Hospital, Dr. Offermann, 100 Hall Professional Center, Kyle, Texas, 78640, 512-268-5003.
23. During construction all contractors and Houston toad monitors will have access to emergency spill kits capable of handling small equipment spills. In the event of a major spill a specialized contractor will be brought in to handle the release. Additionally, a HDD Inadvertent Return Mitigation Plan will be located onsite if a bore or horizontal HDD is proposed. The Applicant will notify the Service of any inadvertent return or major spill. There are no restrictions on night operations of drilling rigs during a HD or bore.
24. Field equipment will be inspected daily for signs of fuel or hydraulic leaks; such leaks will be repaired promptly. These inspections will be conducted by the construction contractor and/or PHP construction inspectors.
25. Access along the ROW through potential Houston toad habitat will be limited to the least amount necessary.
26. The Applicant will make a donation of \$1,050,000 to the Texas Research Incentive Program (TRIP) to be used for Houston toad research and recovery efforts including, but not limited to: surveys, studies, captive breeding, establishing conservation easements and habitat purchases. The Applicant's donation will be matched by the TRIP at a 0.75 to 1 ratio, increasing the available funds to \$1,837,500 for Houston toad research and recovery efforts. The Applicant has an agreement with and will provide \$500,000 to Texas State University and the Service's Houston toad captive breeding program at the San Marcos Aquatic Research Center in San Marcos, Texas. The Applicant proposes to implement this Conservation Measure as part of the project to benefit the species. Captive breeding and headstarting programs help ensure the species recovery. Headstarting is a management practice that protects wild individuals in early life stages. Research furthers our understanding of effective recovery programs and measures. As described later in this document, our jeopardy analysis does not rely on this measure.

Tobusch fishhook cactus

Salvage Collections: Prior to the start of clearing or construction activities within Kimble County, the Applicant will salvage collect TFHC individuals detected within the Project Workspaces. As part of a working agreement, the Applicant will transfer the salvage collected TFHC individuals to Angelo State University for research and/or translocation to other suitable habitats. The Applicant will follow Service guidance regarding salvage collection methods.

II. STATUS OF THE SPECIES

Per the Act's section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to evaluate the current status of the listed species or designated critical habitat. Therefore, we evaluate the current status of the GCWA, Houston toad, and TFHC.

Golden-cheeked warbler

For more specific information regarding the GCWA please refer to the Golden-cheeked Warbler Recovery Plan (Service 1992) and 5-Year Status Review (Service 2014). Both the recovery plan (Service 1992) and 5-Year Status Review (Service 2014) can be found on the Service's webpage for the species: <https://ecos.fws.gov/>. Below we summarize the species information which includes life history, historic and current distribution, reason for decline and threats, and its survival and recovery needs.

Species Description and Life History

The GCWA was emergency listed as endangered on May 4, 1990 (55 FR 18844). The final rule listing the species was published on December 27, 1990 (55 FR 53160). No critical habitat is designated for this species.

The GCWA is a small, insectivorous songbird (Pulich 1965, Orberholser 1974) that breeds exclusively in the mixed Ashe juniper/deciduous woodlands in central Texas west and north of the Balcones Fault (Pulich 1976). The GCWA requires the shredding bark produced by mature Ashe junipers for nest material. Typical deciduous woody species include Texas oak (*Quercus buckleyi*), Lacey oak (*Q. glaucoides*), live oak (*Q. fusiformis*), Texas ash (*Fraxinus texensis*), cedar elm (*Ulmus crassifolia*), hackberry (*Celtis occidentalis*), bigtooth maple (*Acer grandidentatum*), sycamore (*Platanus occidentalis*), Arizona walnut (*Juglans major*), and pecan (*Carya illinoensis*) (Pulich 1976, Ladd 1985, Wahl et al. 1990). Breeding and nesting GCWA feed primarily on insects, spiders, and other arthropods found in Ashe junipers and associated deciduous tree species (Pulich 1976).

Male GCWAs arrive annually in central Texas around March 1st and begin to establish breeding territories, which they defend against other males by singing from visible perches within their territories. Females arrive a few days later, but are more difficult to detect in the dense woodland habitat (Pulich 1976). Three to five eggs are generally incubated in April, and unless there is a second nesting attempt, nestlings fledge in May to early June (Pulich 1976). If there is a second nesting attempt, it is typically in mid-May with nestlings fledging in late June to early July (Pulich 1976). By late July, GCWAs begin their migration southward to their wintering habitat (Chapman 1907, Simmons 1924). The GCWA winters in the highland pine-oak woodlands of southern Mexico and northern Central America (Kroll 1980).

Historic and Current Distribution

The GCWA breeding range occurs on the Edwards Plateau and Lampasas Cut Plain of central Texas. GCWAs have been confirmed breeding in 27 counties: Bandera, Bell, Bexar, Blanco, Bosque, Burnet, Comal, Coryell, Edwards, Gillespie, Hays, Johnson, Kendall, Kerr, Kimble, Kinney, Lampasas, Llano, Medina, Palo Pinto, Real, San Saba, Somervell, Travis, Uvalde, Williamson, and Young (Pulich 1976, Oberholser 1974). Also, GCWA have been sighted in the

following 9 counties: Dallas, Eastland, Erath, Hamilton, Hill, Hood, Jack, McLennan, and Stephens (Pulich 1976, Edwards and Lewis 2008). Diamond (2007) estimated that the amount of suitable GCWA breeding habitat across the species' range was about 4.2 million acres. The most recent estimate available is Duarte et al. (2013), who estimated that GCWA range-wide breeding habitat was about 3.9 million acres for the period of 2010-2011 and that breeding habitat for the period of 1999-2001 was about 5.48 million acres, indicating a decrease in about 1.58 million acres (approximately 29 percent) over 10 years. The status of the GCWA on private lands, where most of its habitat occurs, remains undocumented throughout major portions of the breeding range.

Reasons for Decline and Threats to Survival

Before 1990, the primary reason for GCWA habitat loss was juniper clearing to improve conditions for livestock grazing. Since then, habitat loss has occurred as suburban developments spread into GCWA habitat. Groce et al. (2010) summarized the rates of expected human population growth within the range of the GCWA and found by 2030 the growth rate ranges from 17 percent around the Dallas-Fort Worth area to over 164 percent around San Antonio. As the human population continues to increase, so do associated roads, single and multi-family residences, and infrastructure, resulting in continued habitat destruction, fragmentation, and increased edge effects (Groce et al. 2010).

Fragmentation is the reduction of large blocks of habitat into several smaller patches. While GCWAs have been found to be reproductively successful in small patches of habitat (less than 50 acres), there is an increased likelihood of occupancy and abundance as patch size increases (Coldren 1998, Butcher et al. 2010). In addition, while some studies have suggested that small patches that occur close to larger patches are likely to be occupied by GCWAs (DeBoer and Diamond 2006, Collier et al 2010), the long-term survival and recovery of the GCWA is dependent on maintaining the larger patches (Coldren 1998, Peterson 2001, The Nature Conservancy [TNC] 2002).

As GCWA habitat fragmentation increases the amount of GCWA habitat edge, where two or more different vegetation types meet, exposure to edge-adapted predators like scrub-jays and Texas rat snakes increases and nest survival decreases (Peak 2007). For the GCWA, a habitat edge is where woodland becomes shrubland, grassland, a subdivision, or other land use type, and depending on the type of edge, it can act as a barrier for dispersal, act as a territory boundary, favor certain predators, increase nest predation, or reduce reproductive output (Johnston 2006, Arnold et al. 1996). Canopy breaks (the distance from the top of one tree to another) as little as 36 feet have shown to be barriers to GCWA movement (Coldren 1998). Territory boundaries have not only been shown to stop at edges, but GCWA are more often farther from habitat edges (Beardmore 1994, DeBoer and Diamond 2006, Sperry 2007).

Other threats to GCWAs include clearing of deciduous oaks upon which GCWAs forage, oak wilt infection in trees, nest parasitism by brown-headed cowbirds, drought, fire, stress associated with migration, competition with other avian species, and particularly, loss of habitat from urbanization (Engels and Sexton 1994, Ladd and Gass 1999). Human activities have contributed to GCWA habitat loss throughout their range, particularly areas associated with the Interstate 35 corridor between Austin and San Antonio metropolitan areas.

Range-wide Survival and Recovery Needs

To assess the current status of the species, it is helpful to understand the species' conservation needs which are generally described in terms of reproduction, numbers, and distribution (RND). The Service frequently characterizes RND for a given species via the conservation principles of resiliency (ability of species/populations to withstand stochastic events – numbers, growth rates), redundancy (ability of a species to withstand catastrophic events – number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions).

The recovery strategy outlined in the GCWA Recovery Plan (Service 1992) divides the breeding range of the GCWA into eight regions, or units, and calls for the protection of sufficient habitat to support at least one self-sustaining population in each unit. Based on the GCWA Recovery Plan (Service 1992), protection and management of occupied habitat and minimization of degradation, development, or environmental modification of unoccupied habitat necessary for buffering nesting habitat are necessary to provide for the survival of the species. Habitat protection must include elements of both breeding and non-breeding habitat (i.e., associated uplands and migration corridors). Current and future efforts to create new and protect existing habitat will enhance the GCWA's ability to expand in distribution and numbers. Efforts, such as land acquisition and conservation easements, to protect existing viable populations are critical to the survival and recovery of this species, particularly when rapidly expanding urbanization continues to result in the loss of breeding habitat.

Several large GCWA populations have some protections or are otherwise currently managed to provide for long-term conservation of the GCWA: Fort Hood Military Reservation (recovery region 3), the Refuge (recovery region 5), Balcones Canyonlands Conservation Plan Preserve (recovery region 5), Government Canyon State Natural Area and Camp Bullis (recovery region 6), and Bandera Canyonlands Conservation Bank (recovery region 8). While significant progress has been made towards conserving these relatively large GCWA populations, none have fully met established recovery criteria (Service 1992, Service 2014). The PHP will affect GCWA breeding habitat in Menard and Kimble County (recovery region 7), Gillespie County (recovery region 6), Blanco County (recovery regions 5 and 6), and Hays County (recovery region 5). The Igau Ranch is located within recovery region 5, where the majority of the PHP GCWA impacts will occur. Conservation Banks with available GCWA mitigation credits have been established in recovery regions 5 and 8, but not 1, 2, 3, 4, 6, or 7, although some have Service Areas that include Gillespie, Blanco, and Hays County.

According to the GCWA Population and Habitat Viability Assessment Report (Service 1996) a viable population needs to consist of at least 3,000 breeding pairs. This and other population viability assessments on GCWA have indicated the most sensitive factors affecting their continued existence are population size per patch, fecundity (productivity or number of young per adult), and fledgling survival (Service 1996, Alldredge et al. 2002). These assessments estimated on viable population will need a minimum of 32,500 acres of prime unfragmented habitat to reduce the possibility of extinction of that population to less than five percent over 100 years (Service 1996); this estimate of minimum number of breeding pairs increases in poorer quality habitat (e.g., patchy habitat resulting from fragmentation).

Several state and federally owned lands occur within the breeding range of the GCWA, but the majority of the species' breeding range occurs on private lands that have been either occasionally or never surveyed. Several large GCWA populations have some protections or are otherwise currently managed to provide for long-term conservation of the GCWA: Fort Hood Military Reservation (recovery region 3), the Refuge (recovery region 5), Balcones Canyonlands Conservation Plan Preserve (recovery region 5), Government Canyon State Natural Area and Camp Bullis (recovery region 6), and Bandera Canyonlands Conservation Bank (recovery region 8). According to the Corps' Regulatory In-lieu Fee and Bank Information Tracking System, there are also several conservation banks (CB) that protect GCWA habitat (acres represent the total if all bank credits are sold): Hickory Pass/Ridge CB (3,514 acres) in Burnet County, Bandera Corridor CB (4,506 acres) in Bandera and Real Counties, Clearwater CB (1,382 acres) in Burnet County, Festina Lente CB (1,132 acres) in Bandera County, and Camp Wood CB (4,012 acres) in Real County. While significant progress has been made towards conserving GCWA populations throughout the recovery regions, none have fully met established recovery criteria (Service 1992, Service 2014).

According to the Service's records, we have completed approximately 74 formal section 7 consultations, which authorized approximately 104,300 acres of GCWA habitat impacts across the breeding range of about 3.9 million acres (Duarte et al. 2013); this total of section 7 consultations and acreage impacts does not include incidental take permits associated with habitat conservation plans. The majority of impacted acreage is due to larger formal section 7 consultations such as: 1) Fort Hood military activities (over 37,000 acres); 2) brush control projects throughout the species range (over 25,000 acres); and 3) Camp Bullis military activities (5,000 acres). Conservation resulting from these larger consultations is approximately 61,300 acres of GCWA habitat maintained on Department of Defense (DOD) land, and over 22,000 acres of private land preserved or maintained for GCWA conservation.

The Service has also issued approximately 137 individual section 10(a)(1)(B) incidental take permits along with their associated formal section 7 consultations. Approximately 58,000 acres of GCWA habitat have been authorized to be impacted through section 10. The majority of this total consists of: Balcones Canyonlands Conservation Plan (21,000 acres); Hays County Regional Habitat Conservation Plan (HCP) (9,000 acres); Williamson County Regional HCP (6,000 acres); Southern Edwards Plateau HCP (5,000 acres); Comal County Regional HCP (5,200 acres); Oncor programmatic HCP (3,000 acres); LCRA's Competitive Renewable Energy Zone HCP (1,100 acres); and LCRA's Transmission System Corporation HCP (4,198 acres). When fully implemented the HCPs would result in the conservation of nearly 88,000 acres of GCWA habitat and almost 1.3 million dollars for the preservation and maintenance of conservation for the benefit of the species.

Houston toad

For more specific information regarding the Houston toad please refer to the Houston toad Recovery Plan (Service 1984) and 5-Year Status Review (Service 2011 and 2018). Both the recovery plan and 5-Year Status Review can be found on the Service's webpage for the species: <https://ecos.fws.gov/>. Below we summarize the species information which includes life history,

historic and current distribution, reason for decline and threats, and its survival and recovery needs.

Species Description and Life History

The Houston toad was listed as endangered on October 13, 1970 (35 FR 16047 - 16048). Critical habitat for the Houston toad was designated in portions of Bastrop and Burleson counties, Texas, on January 31, 1978 (43 FR 4022 - 4026).

Houston toads are a Texas endemic species. They are small, brown, and speckled amphibians which typically occupy habitat characterized as rolling uplands covered with pine or pine/oak forest underlain by deep sandy soils. The life expectancy of the Houston toad is at least three years, but may be longer (Price 1993). Males reach sexual maturity at about one year of age, but females require one to two years to achieve reproductive maturity (Quinn 1981, Quinn and Mengden 1984). Studies have shown sex ratios are skewed in favor of males ranging from 3:1 to 10:1 (Dixon et al. 1990, Forstner 2002a, 2002b, 2003, 2006).

Houston toads live on land following metamorphosis and return to water only briefly during the breeding season. As adults, Houston toads may range widely through upland habitats (Price 1990, 1992; Dixon et al. 1990). Breeding is often followed by aestivation, a state of dormancy, but toads are known to emerge and be active during the non-breeding season (Dodd and Cade 1998, Dixon et al. 1990, Forstner 2002a). However, because of the toad's secretive nature, little is known about its distribution and activities during this period.

Although Houston toads are associated with forests and sandy soils (Kennedy 1962, Brown 1971), they may also breed in and move across sparsely wooded and even cleared, open areas (Dixon et al. 1990). Because Houston toads are ectotherms (species that depend on environmental heat sources to control their body temperatures) and their skin is highly vulnerable to desiccation (extreme dryness), they become dormant during harsh weather conditions, such as winter cold (hibernation) and summer heat and drought (estivation). They seek protection during these periods by burrowing into sand or hiding under rocks, leaf litter, logs, or in abandoned animal burrows (Hillis et al. 1984, Swannack 2007).

Canopy cover appears to be a necessary component of Houston toad habitat. Most Houston toad locations are in, or very near, forested patches of habitat (Buzo 2008, Forstner and Dixon 2011). Those locations outside of forested areas were documented historically (prior to 1990) and were likely within woodlands or forested habitat at the time they were recorded (Buzo 2008, Forstner and Dixon 2011). Houston toads have never been found farther than about 50 meters (164 feet) from a forested edge (Forstner 2003). Telemetry data has also shown that Houston toads move along drainages within pastures, provided that some canopy cover is present (Swannack 2007, Forstner and Dixon 2011).

It is possible that the species is adaptable to a wide variety of overstory vegetation types. Tree species typically found within Houston toad habitat vary, but often include loblolly pine (*Pinus taeda*), post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), or sandjack oak (*Q. incana*) (Forstner 2003). Although the Houston toad does not appear to be tied to the presence of a particular tree species, pine is dominant in the Lost Pines region of Bastrop County (Thomas

1977), which has once been known to support large populations of Houston toads (Hillis et al. 1984).

Herbaceous vegetation on the forest floor is also an important component of Houston toad habitat, as it supports native arthropod species (invertebrate species, such as insects) that Houston toads feed on (Harris 1984, Bragg 1960, Clarke 1974). Studies have shown that canopy cover allowing light to penetrate the forest floor can result in increased herbaceous plant diversity (Halls and Schuster 1965). The diversity of the arthropod community has been shown to increase with increasing plant diversity (Siemann et al. 1998). Also, increases in arthropod density and biomass have been correlated to increases in the biomass of herbaceous vegetation in prairie ecosystems (Kirchner 1977). Therefore, we assume that the availability of herbaceous vegetation on the forest floor can influence the amount of arthropods available as a food source for Houston toads within their habitats.

Water is an essential component of Houston toad habitat. Rainfall has been shown to stimulate breeding (Kennedy 1962, Price 1992), movement (Quinn et al. 1984, Swannack 2007), and foraging (Swannack 2007). Houston toads are known to breed in small pools of water and ephemeral ponds (Kennedy 1962, Brown 1971, Forstner 2003). They also have been heard calling from or have been captured in ditches, lakes, puddles in roads, moist areas in yards, flooded pastures, potholes, streams, stock tanks, and permanent ponds (Forstner 2001, Forstner 2003). Survival of eggs, tadpoles, and emerging juveniles may be low in permanent water bodies because they are more likely to harbor predators, such as birds, mammals, snakes, turtles, fish, aquatic invertebrates, and bullfrogs and potential competitors and hybridizers, such as Woodhouse's and Gulf Coast toads (Forstner 2003, Hillis et al. 1984).

Houston toad habitat may be broken down into three main components: 1) breeding and nursery habitat, 2) core habitat, and 3) dispersal habitat. Breeding and nursery habitat includes those areas with standing or still water, as found in a pond or wetland (Forstner and Dixon 2011). The presence of water during and after breeding is required for egg deposition, egg hatching, tadpole development, and emergence of metamorphosed tadpoles from a breeding site.

Core habitat includes the 200 meters (656 feet) of upland, terrestrial habitat surrounding a breeding site where adults are most commonly found (Swannack 2007, McHenry and Forstner 2009). This habitat is important for the persistence of pond-breeding amphibians because these habitats are where amphibians spend the majority of their life cycles (Semlitsch 1998, Semlitsch 2000). They can be a place of refuge in and around urban and agricultural areas (Knutson et al. 1999). Upland areas also provide: 1) habitat portioning needed to protect Houston toads from competition with other toad species, 2) food resources and feeding areas, and 3) cover to escape from predators and harsh climatic conditions (Knutson et al. 1999).

Houston toad dispersal habitat is comprised of the corridors through which unidirectional movements of juveniles and adults take place (McHenry and Forstner 2009). Juvenile dispersal is important for the persistence of amphibian populations, as it is likely necessary for population survival, recruitment immigration, genetic exchange, and maintaining the metapopulation dynamics of anuran populations (Berven and Grudzien 1990, Semlitsch 2000, Bull 2009).

This species tends to concentrate their reproductive efforts into producing large numbers of eggs, but it is estimated that each egg has a low probability (0.03 percent) of survival to one year (Greuter 2004). Eggs are laid in strings in the water and hatch into tadpoles that metamorphose into juvenile toadlets approximately 60 days after egg deposition (Hillis et al. 1984). After metamorphosis, juvenile Houston toads move into the surrounding terrestrial habitats where they grow and develop into adults (Forstner 2003).

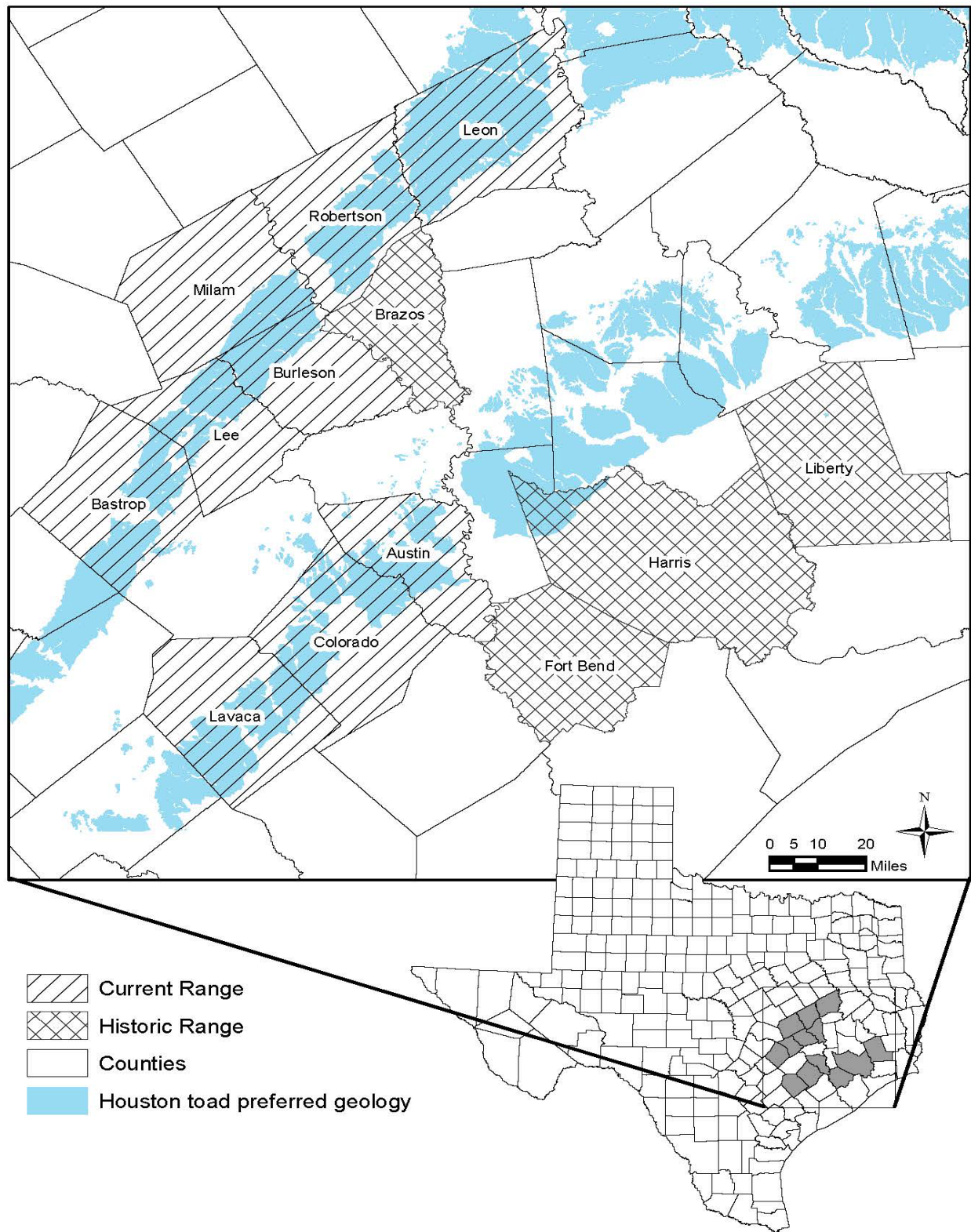
The Houston toad is an “aggregative” and “explosive” breeder, appearing in large numbers at breeding ponds (aggregative) where the males chorus to attract females and compete with each other to breed over a period of a few nights throughout the breeding season (Wells 1977, Price 2003). Chorusing can begin as early as January (Dixon 1982, Hillis et al. 1984), but typically breeding occurs from late January to June (Kennedy 1962, Dixon 1982, Hillis et al. 1984). Peak reproductive activity occurs in March, depending on weather conditions (Swannack 2007). Once males reach a breeding pond, they often call from the pond’s edge in shallow water or within several feet of the pond’s edge. On some nights during the Houston toad’s breeding season, males may be present but not chorusing at breeding ponds (Kennedy 1962). They generally move throughout the pond during a given night, while female Houston toads often reach the breeding pond beginning at sunset and continuing up to several hours after sunset (Hillis et al. 1984). Reported clutch sizes per female vary from 512 to 6,199 eggs (Greuter 2004, Kennedy 1962, Quinn and Mengden 1984, Quinn et al. 1987). In wet years, breeding may occur wherever sufficient standing water is present. This species typically uses ephemeral rain pools for breeding, although it has been known to breed in flooded fields and permanent ponds. For successful breeding, water must persist for at least 60 days to allow for egg hatching, tadpole maturation, and emergence of toadlets (Hillis et al. 1984, Price 1992). Development rates of Houston toads vary depending on temperature and other factors. Eggs may hatch within seven days and tadpoles may remain in the pond for 40 to 80 days depending on environmental conditions.

Metamorphosis of tadpoles in a given pond generally occurs at approximately the same time over a period of a few hours, resulting in post-metamorphic aggregations of toadlets that remain at the edge of the pond for seven to ten days or more (Hillis et al. 1984, Dixon et al. 1990, Forstner 2002a). Hillis et al. (1984) observed large numbers of toadlets moving as far as 330 feet in daylight from their natal ponds along the same gullies used by adult toads during the breeding season. Mortality in young toads is extremely high due to predation and drying of breeding sites, and less than one percent of eggs laid are believed to survive to adulthood (Quinn 1981; Price 1992; Forstner 2002a, 2002b, 2003; Greuter and Forstner 2004). The results from field surveys in 2006 found the Houston toad juvenile survival rate to be approximately 0.03 percent (Forstner 2006). Forstner (2002c) documented instances of chorusing that did not appear to result in eggs or toadlets; therefore, successful chorusing may not mean successful breeding.

Historic and Current Distribution

Current and historic Houston toad populations occur along two bands of geologic formations dominated by sandy soils (Figure 3). One band runs through Bastrop, Lee, Burleson, Milam, Robertson and Leon Counties and includes the Carrizo, Queen City, Reklaw, Sparta, and Weches formations. The other band runs through Lavaca, Colorado, and Austin Counties and includes

Figure 3. Houston toad range map with geologic formations.



the Willis and Goliad formations (Forstner 2003). It is not clear if the Houston toad requires sandy soils to persist in an area, or if its distribution is correlated to sandy soils because these soils within the Houston toad's range typically support forests. Either way, it is likely that both sandy soils and the vegetation they support are key components to defining the Houston toad's habitat (Forstner and Dixon 2011).

Currently the largest known and most studied population of Houston toads occurs in Bastrop County within the Boy Scout's Griffith League Ranch (GLR). The GLR serves as a working CB for the Houston toad, and is a focus of recovery efforts for the species. The GLR Houston toad population has been supplemented since 2007 with adults, juveniles, and egg strands from Houston toad breeding facilities (MacLaren and Forstner 2019). Duarte et al. (2011) estimated the 2010 total adult population on the GLR to be between 241 and 368 individuals.

Currently the largest known and most studied population of Houston toads occurs in Bastrop County within the Boy Scout Griffith League Ranch (GLR). The GLR serves as a working conservation credit bank for the Houston toad, and is a focus of recovery efforts for the species. The GLR Houston toad population has been supplemented since 2007 with adults, juveniles, and egg strands from Houston toad breeding facilities (MacLaren and Forstner 2019). Duarte et al. (2011) estimated the 2010 total adult population on the GLR to be between 241 and 368 individuals. Individual adult Houston toad detection trends after the 2011 fires, which burned approximately half of the GLR's approximate 4,820 acres, have generally been upward: 2011 (1 detection), 2012 (26 detections), 2013 (2 detections), 2014 (12 detections), and 2015 (17 detections), 2016 (55 detections), 2017 (56 detections), 2018 (230 detections) and 2019 (190 detections) (MacLaren and Forstner 2019). Houston toads have been documented in Austin, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson Counties (Service 2011, MacLaren and Forstner 2018). Current species abundance outside of Bastrop County is not well known as more detection efforts are needed within these counties.

Reasons for Decline and Threats to Survival

The primary factors influencing the status of the Houston toad include habitat loss through destruction, modification, fragmentation, and fire suppression, including conversion to agriculture and urban areas (Forstner and Dixon 2011). Although there are distinct differences between habitat destruction, alteration, and fragmentation on the landscape, it is difficult to determine which of these processes is causing specific effects to Houston toad populations at any given time. This is partly because multiple sources of these threats are occurring concurrently within the Houston toad's range. All three processes may be caused by anthropogenic sources (human activities), such as urbanization, logging, and agricultural practices. Habitat loss and habitat fragmentation typically occur together (Fahrig 1997), although fragmentation is often considered a secondary effect of habitat destruction.

Wildfire and fire suppression have both negatively impacted Houston toad habitat. More than 60 years of fire suppression has considerably altered the forested habitat within the Houston toad's range (Forstner and Dixon 2011). Although periodic controlled burns help to reduce fuel loads, prevent catastrophic fires, and improve habitat conditions beneath the forest canopy (Yantis 1989, Price 1993), severe wildfires can be detrimental to the Houston toad particularly for small,

isolated populations. The most considerable effects to the Houston toad from catastrophic wildfire are the adverse changes to its habitat. The loss of understory vegetation, surface debris (leaf litter and logs), and canopy cover can lead to increased exposure to temperature extremes and predation, loss of habitat availability, and reduced dispersal and foraging capabilities. Soil erosion, which is a typical occurrence following wildfires (Kocher et al. 2009), can affect Houston toad breeding habitat by decreasing water quality in ponds.

The Bastrop County Houston toad population was impacted by a record drought in 2011 and by catastrophic wildfires in 2009, 2011, and 2015. The Wilderness Ridge wildfire of 2009, the Bastrop County Complex Fire of 2011, and the Hidden Pines Wildfire of 2015 burned 1,491 acres, 31,453 acres, and 4,580 acres, respectively (TPWD 2015). All of the more than 37,000 acres burned represents approximately 45 percent of the 82,464 acres of Houston toad designated critical habitat within Bastrop County.

Livestock wading and feral hog use of potential Houston toad breeding sites are also potential threats to the species. Livestock and hogs can prevent vegetation from establishing around a pond's perimeter and result in high levels of nitrates (from nitrogenous wastes, such as urine and manure), increased turbidity, decreased water quality, and an overall adverse environment for amphibian egg and tadpole development (Forstner 2001; Knutson et al. 1999; Schmutzer et al. 2008; Bull 2009).

Other threats to the Houston toad include disease and predation. Chytridomycosis or “chytrid fungus” (*Batrachochytrium dendrobatidis*) is a fungal disease that is responsible for killing amphibians worldwide (Daszak et al. 2000). Chytrid fungus has been detected in Houston toads, and in other amphibians occurring within the Houston toad’s range (Gaertner et al. 2009). Predators of the Houston toad include water snakes (*Nerodia* sp.), bullfrogs (*Rana catesbeiana*), raccoons (*Procyon lotor*), and various species of carnivores (for example, skunks and foxes) (Freed and Neitman 1988, Ferguson et al. 2008). Red-imported fire ants (*Solenopsis invicta*) are also known to prey on newly-metamorphosed Houston toad toadlets as well as the invertebrate community that is believed to be an important part of the food base for the Houston toad (Bragg 1960, Freed and Neitman 1988, Porter and Savignano 1990).

Range-wide Survival and Recovery Needs

The Houston toad recovery plan was approved by the Service on August 17, 1984. Delisting criteria were not established in the recovery plan. The overall strategy for recovering this species involves restoring and maintaining habitat adequate to support resilient, viable populations/metapopulations across its range. Although not specifically within the recovery plan, the Houston Toad Recovery Team has recommended “focus areas” to concentrate on-the-ground recovery actions for the Houston toad, such as habitat management and population restoration efforts. The objective is for each focus area to support at least one resilient, viable metapopulation within fully-functioning forested habitat.

The actions for recovering the Houston toad involve protecting, enhancing, restoring, and managing forested habitat to support self-sustaining (viable) populations of this species and the ecosystems on which it depends (Service 1984). In addition, they include intensive efforts to

bolster Houston toad populations through population restoration efforts that include captive propagation, headstarting, and reintroductions.

Although a Houston toad recovery plan does exist, the species would greatly benefit from an updated recovery plan detailing recovery criteria that the best available science indicates are necessary to recover or protect the species.

Currently the largest and most studied population of Houston toads exists within Bastrop County, Texas. Most efforts to conserve the Houston toad have occurred within Bastrop County with three habitat conservation plans to include the Lost Pines HCP, "Utilities" HCP, and The Boy Scouts of America HCP for the GLR. The Boy Scouts HCP resulted in the creation of the only operating Houston toad conservation bank with the potential to protect approximately 4,820 acres of Houston toad habitat.

The TPWD owns two state parks in Bastrop County on which Houston toads exist. These parks are Bastrop and Buescher State Parks, and total approximately 7,000 acres. Although these parks have multiple uses, TPWD does manage the majority of acreage for the benefit of the Houston toad. TPWD also administers the Houston Toad Programmatic Safe Harbor Agreement, which is a 30-year agreement for implementation of conservation activities for the enhancement of Houston toad habitat within 4 focus areas totaling 565,722 acres across the Houston toad's nine-county range. This program enrolls private landowners into agreements for the benefit of the Houston toad. The counties include Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson Counties, Texas.

The Service has previously authorized incidental take for Houston toad through a variety of projects. Past federal projects, at least 21, have included cell tower installations, federal highway construction and repair projects, petroleum pipeline installations, and wildfire restoration and recovery efforts. The Service finalized a formal section 7 consultation with the U.S. Army Corps of Engineers for the construction of a petroleum pipeline through a portion of the Houston toad's habitat in Bastrop County. Mitigation for this project will serve to fund ongoing Houston toad captive propagation efforts. The Service reinitiated a formal consultation with the Federal Highways Administration on the rehabilitation of U.S. Highway 290 within Bastrop County; this consultation was concluded in 2013 and authorized incidental take of 12 individuals and 84.6 acres of habitat.

Recent formal section 7 consultations include two U.S. Housing and Development (HUD) projects in Bastrop County which were concluded in 2017 and 2018. The 2017 HUD consultations resulted in the Service authorizing take of two 2 individuals per year and 1.9 acres of habitat removal. The 2018 HUD consultation authorized take of 11 individuals per year and 21.6 acres of habitat removal. Mitigation for these consultations included an agreement to purchase approximately 23.5 acres of Houston toad conservation credits which will be protected in perpetuity from a Service approved Houston toad mitigation bank.

The Corps issued a Clean Water Act section 404 authorization for a 142-mile potable water pipeline from Burleson County to Bexar County, Texas, which included portions of the Houston toad's range within Bastrop, Burleson, and Lee Counties. The Service finalized a formal section

7 consultation on this project in 2017. A number of best management practices will be implemented to avoid or minimize adverse effects to Houston toads; however, when it is completed, the pipeline is expected to result in the incidental take of about 90 acres of Houston toad habitat.

Additionally, the Service has issued three section 10(a)(1)(A) permits for Houston toad safe harbor agreements (SHA) and 252 section 10(a)(1)(B) permits for the Houston toad for habitat conservation plans (HCP) across the species' range (188 of these permits were part of the 46-subdivision HCP which was dissolved and included within Lost Pines HCP).

The TPWD Programmatic Safe Harbor Agreement estimated a total of 707 toads will be incidentally taken over the proposed Agreement's 30-year permit period due to conservation activities. The Service also estimated the amount of take due to habitat loss (at full implementation) would result in 35,357 acres lost if all enrolled land owners returned their properties to original baseline habitat conditions.

Tobusch fishhook cactus

For more specific information regarding the TFHC please refer to the Tobusch Fishhook Recovery Plan (Service 1987), Tobusch Fishhook Cactus (*Sclerocactus brevihamatus* spp. *Tobuschii*) 5-year Review: Summary and Evaluation (Service 2010), the Species Status Assessment Report for Tobusch Fishhook Cactus (*Sclerocactus Brevihamatus* spp. *Tobuschii*) (Service 2017), and Endangered and Threatened Wildlife and Plants; Reclassifying Tobusch Fishhook Cactus From Endangered to Threatened and Adopting a New Scientific Name (83 FR 22392).

Species Description and Life History

The TFHC was listed as endangered on November 7, 1979 (44 FR 64736), as *Ancistrocactus tobuschii* and was reclassified to threatened on June 14, 2018 (83 FR 22392), as *Sclerocactus brevihamatus* spp. *tobuschii*. The current known portion of the species' range occurring within the action area is in Kimble County, Texas. The TFHC is a rare endemic plant of the Edwards Plateau of central Texas that is armed with curved "fishhook" spines. In the wild this globose or columnar cactus rarely exceeds five centimeters in diameter and in height, but may reach 10 centimeters in diameter and height (Poole and Janssen 2002). There are three to five central spines that arise from the center of areoles and project outward, while one central spine is abruptly curved. Flowers emerge from the top of the stem and have numerous yellow tepals, and bear an average of two to three flowers per plant (Poole and Janssen 2002). Fruits lack spines, are elongate (2.5 to 3.5 centimeters), turning reddish-green and usually splitting open when mature (Emmett 1995).

Growth rates are slow, averaging from one to several millimeters per year. The cactus becomes reproductive when reaching an average of at least two centimeters in diameter, which is approximately 9 years. Flowering duration is approximately two to three weeks, starting as early as late January in southern portions of the species' range, and lasting as late as mid-March in the northern part of the range (Poole and Janssen 2002). Honey bees and halictid bees are effective pollinators, although the latter group may be more active later in the flowering season. The breeding system is primarily out-crossing, but the species is capable of self-fertilization. Fruits

ripen around mid-May and ants remove a large proportion of seeds, pulp, and funiculi, but it is unknown if the ants consume or disperse seeds. Mammals or birds also consume fruits and may account for longer-distance dispersal (Emmett 1995). Moderate numbers of viable seeds have been found in the soil near live plants, but the extent of longevity of soil seed banks is unknown.

Tobusch fishhook lifespan may be decades long, and Poole and Janssen (2002) observed individuals that had lived for more than 10 years. Based on observed growth rates, individuals become reproductive at approximately 9 years of age, and large individuals may be at least 50 years old. Annual mortality rates of established individuals are often greater than 20 percent. Assuming an average annual mortality of 20 percent, only 13 percent of individuals would live long enough to reproduce once.

The great majority of documented populations occur in upland sites dominated by Ashe juniper-live oak woodlands and savannas on the Edwards Plateau. Soils are classified in the Tarrant, Ector, Eckrant, and other similar types underlain by massive fractured limestone primarily of the Edwards formation (Poole and Jansen 2002). Within a matrix of woodland and savanna, the species occurs in discontinuous patches of very shallow, gravelly soils where bare rock and rock fragments comprise a large proportion of the surface cover.

Historic and Current Distribution

TFHC has been documented in eight Texas counties to include Bandera, Edwards, Kerr, Kimble, Kinney, Real, Uvalde, and Val Verde (Poole et al. 2007). The Service's (2017) potential habitat model indicates suitable habitat may exist beyond the aforementioned counties and include adjacent counties (Crockett, Gillespie, Kendal, Menard, Sutton, and a small portion of Mason county). TFHC have not been confirmed in these adjacent counties, and only a small proportion of the area outlined in the potential habitat model would be suitable (microsite habitat that includes patches of very shallow, gravelly soils where bare rock and rock fragments comprise a large proportion of the surface cover). The documented total population as of 2015 is approximately 4,500 individuals, with an extrapolated range-wide estimate of around 480,000 individuals (Service 2017).

Reasons for Decline and Threats to Survival

Some threats include insect predation, soil disturbance, herbivory, trampling, root rot, fungal infections, and woody plant encroachment due to lack of fire. Overall, parasitism appears the largest contributor to TFHC declines. The TFHC weevil (*Gerstaeckeria* sp. nov) and cactus longhorn beetle (*Moneilema* spp.) parasitize and kill the cacti and have contributed significantly to drastic declines in many of the known populations (Calvert 2003). Adult weevils lay eggs on the cactus. The weevil larvae mature within the cactus stem, consuming it as they mature, and leaving behind holes or chambers, usually killing the plant (Poole and Janssen 2002, Poole et al. 2003). Calvert (2003) conducted a laboratory study on the effect of the weevil on the TFHC host and found the weevil was responsible for 44.8 percent of cacti deaths.

Poole et al. (2003) observed other insect predators like the longhorn beetle and unidentifiable fly larvae within the stem or roots of the cacti. Calvert (2003) found 7.5 percent of cacti deaths in a lab setting were due to the longhorn beetle. An unidentified ant species has also been observed using the cactus as a base for their mounds which may lead to smothering plants, although field

studies show ants account for less than one percent of cactus mortality. Jackrabbits may browse on the cactus, but in most sites cause less than two percent mortality (Poole et al. 2003). Also, feral hogs have uprooted plants at many sites (Reemts 2014).

Bray (1904) documented the rapid transition of grasslands to woodlands in the Edwards Plateau occurring more than a century ago, and attributed the change to over-grazing, depletion of grasses, and the cessation of wildfires. Lack of fire regime, both natural and anthropogenic, transformed the shrublands into woodlands with Ashe juniper being the most successful of many woody plants that have invaded grasslands (Fonteyn et al. 1988). Woody plant encroachment in rocky open habitat is one of several habitat related threats (Reemts 2014). Prescribed fires seem to have little effect on individual plant survival. However, when conducted during late bud formation, flowering, or fruiting periods may lead to loss of reproductive structures (Poole et al. 2003).

Relatively little urban and industrial development is occurring within the semi-arid, sparsely populated eight-county known range of the TFHC. However, a significant ongoing trend throughout the species' range is the subdivision of large ranches into many small "ranchettes," leading to the proliferation of roads, fences, power lines, and residential development, all of which contribute incrementally to habitat loss and fragmentation. Climate changes are believed to likely affect the cactus; however, the net effects of those changes are unclear (Service 2017).

Range-wide Survival and Recovery Needs

The Tobusch fishhook cactus recovery plan was approved by the Service on March 18, 1987, and recommended 3,000 individuals in each of 4 safe sites for reclassification from endangered to threatened. Although the original downlisting criterion had not been met, the Service's (2010) 5-year status review recommended that the species be reclassified from endangered to threatened. The recommendation was based on an expansion of the known range of the species, the existence of multiple resilient populations, and that it possessed sufficient genetic diversity to conserve long-term adaptive capability. However, the species still faces threats from changes in vegetation and wildfire frequency, insect parasites, and the potential effects of climate change (Service 2017); therefore, the Service reclassified Tobusch fishhook cactus to threatened on May 15, 2018 (83 FR 22392) and in 2019 defined delisting criteria for the species (Service 2019a). These criteria include: 1) populations or portions of metapopulations within 10 or more protected natural areas, 2) the 10 or more protected natural areas must conserve the full geographic and ecological range of the subspecies, 3) populations or portions of metapopulations within each protected natural area have 1,200 or more mature individuals, and 4) periodic monitoring indicates that the minimum viable population level of 1,200 mature individuals within each protected natural area has remained stable or has increased over a period of 45 years. Currently, many small populations exist, and surveyors have documented a total of approximately 4,500 individuals in 8 counties of the Edwards Plateau. Monitored populations ranging from 34 to 1,090 individuals, and occur on 12 properties managed either by the State or conservation organizations (Service 2017).

Pavlik (1996) uses a surrogate species approach to estimate Minimum Viable Population (MVP) and Poole et al. (2003) used this method to estimate a MVP of 1,200 individuals. Since few

individual colonies reach this size, and since large colonies are more vulnerable to insect parasites, the Service (2017) recommended that the MVP of 1,200 individuals be applied to meta-populations that consist of multiple colonies distributed at a landscape scale.

As of 2015, populations have been documented and monitored on eight areas managed by TPWD, two managed by TNC, and one managed by Texas Land Conservancy. As of 2008, for populations occurring on TPWD managed areas, summarized survey data illustrates a steady increase in the total numbers of individuals detected while the number of individuals at specific sites within areas tends to fluctuate over time. Of these monitored state areas, two locations have experienced declines below individual numbers documented on initial surveys (Devils Sinkhole and Lost Maples). The remaining six monitored areas have experienced a general increase in number of surveyed individuals (Walter Buck, Garner, Junction, Kerr, Pole Hollow, and Kickapoo) since initial surveys (Service 2017).

Trend data is not available at all monitored locations as survey efforts have varied. Texas Land Conservancy manages Coto Los Rincones and documented 84 individuals in 2003. The Nature Conservancy documented 100 individuals at Dolan Falls Preserve in 1992, and 1,035 individuals at Love Creek Preserve in 2015. Texas Parks and Wildlife Department documented 17 individuals at Devil's River State Natural Area in 2003. Individual TFHC numbers reported are from fixed plots, and are not exhaustive surveys of the entire properties; the actual population sizes and densities may be larger (Service 2017).

The demographic pattern emerging from survey results of monitored populations suggests a non-symmetrical oscillation where colonies and populations establish and increase gradually, then rapidly decline from weevil infestations to a point too low to sustain the parasites (Service 2017). The largest documented population, at Devil's Sinkhole State Natural Area in Edwards County, reached 1,100 individuals in 1994, but declined to only 16 individuals by 2000 as a result of weevil predation (Service 2010). The Kickapoo Caverns population is an example of an oscillating population. The Kickapoo population reached a low of 95 individuals in 1995, then steadily increased to 554 in 2001, and subsequently declined to 217 individuals by 2008 (Service 2017).

Few surveys have been conducted on roughly 95 percent of the potential habitat that is privately owned. Since the populations are small and widely distributed, there is low probability of detecting populations on any fixed area, such as a state park (Service 2017). Meta-populations are likely distributed over areas that are larger than individual parks and natural areas which indicate a larger population size exists (Service 2017).

The survival and recovery of the species will require restoration and careful management to provide sufficient number of meta-populations and individuals in effective proximity to each other for successful pollination to ensure the continuity of the species. Broader studies are needed to understand the effects of fire on the species' habitat and as a management tool. Studies on the effects and possible cycles of the Tobusch fishhook cactus weevil would increase our knowledge of a major threat to the species. Continued annual monitoring of the species would help us understand longevity of individuals, dispersal, mortality, and their causes.

According to the Service's records there have been a total of 11 formal section 7 consultations, all outside of the action area. Of these formal consultations, four accounted for most removal of cacti from project footprints and include one transmission line project and three pipeline projects; these projects resulted in the removal of approximately 581 cacti occurring on private land. Approximately 460 cacti associated with these projects were salvaged and provided to the Lady Bird Johnson Wildflower Center along with funding to support their use in future reintroduction projects and scientific research supporting conservation efforts. Approximately 121 cacti were salvaged through an agreement with Angelo State University for research and reintroduction.

III. STATUS OF CRITICAL HABITAT

Critical Habitat has not been designated for the GCWA or TFHC. We designated critical habitat for the Houston toad in Burleson and Bastrop counties. The proposed project does not have the potential to affect Houston toad designated critical habitat because it will not be located in Burleson and Bastrop counties; therefore, we do not analyze critical habitat in this biological opinion.

IV. ENVIRONMENTAL BASELINE

Service regulations found at 50 C.F.R. 402.02 define the Environmental Baseline as "the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline" (50 CFR 402.02).

Status of the Species within the Action Area

Golden-cheeked warbler

The Applicant performed a review of potential GCWA breeding habitat within an 800-foot wide corridor within the action area and completed mapping of GCWA habitat by inspecting recent aerial imagery to delineate woodland with apparent structure and composition consistent with the characteristics of GCWA breeding habitat as described by Campbell (2003). The analysis was conducted for the portions of the proposed project within Kimble, Gillespie, Blanco, and Hays counties. Other counties were omitted from the analysis as they are not within the known or suspected breeding range of the GCWA. Areas delineated as GCWA breeding habitat were verified via helicopter fly-over on October 4, 2018, by a 10(a)(1)(A) Service-permitted biologist. No presence/absence surveys for GCWA were conducted as part of this project because the Applicant conservatively assumes all identified potential habitat to be occupied by the GCWA during the breeding season.

As part of the potential habitat review, the Applicant identified a total of 282.0 acres of potential GCWA breeding habitat that would be destroyed by the project. Removal of the 282.0 acres of habitat would then result in consequences to an additional 1,352.3 acres of potential breeding habitat when considering a 300-foot buffer from either side of the habitat adjacent to suitable GCWA breeding habitat, as this habitat becomes degraded due to fragmentation and creation of additional edge. Scaling up from the action area to GCWA recovery regions (Service 1992), the PHP alignment, as proposed, will pass through GCWA recovery regions 5, 6, and 7, and will remove 144.7 acres, 28.3 acres, and 109.0 acres of GCWA breeding habitat, respectively (see Table 12 in the BA for more detail). Given the 300-foot wide buffer from either side of the habitat removal, impacts resulting from habitat removal in recovery regions 5, 6, and 7 include 640.4 acres, 160.7 acres, and 551.2 acres, respectively. Thus, 785.1 acres, 189.0 acres, and 660.2 acres of habitat will be affected in recovery regions 5, 6, and 7, respectively (Table 1).

Recovery regions 5, 6, and 7, vary in their degree of habitat availability, quality, and level of impact but each contains some habitat that is high quality and some that is of lower quality or degraded. Recovery region 5 contains both high quality, contiguous blocks of habitat as well as high levels of fragmentation and habitat loss in and around urban areas. The best quality habitat will be those areas that have the mature mixed oak and juniper woodlands in patches of 500 acres or greater that the species needs where the habitat is not fragmented by roads, utility easements, and other developments. The conservation property that the Applicant has proposed to purchase and place into perpetual conservation is in recovery region 5. The property is high quality habitat, and adjacent to other areas of high quality habitat that are protected for the conservation of the GCWA.

While one mitigation approach would be to protect habitat in each of the three affected recovery units, another approach, and the one used by the PHP, is to locate one large contiguous block of habitat that is of high conservation value. The conservation property is not currently protected from clearing and is adjacent to already protected land at the Refuge, which would reduce future fragmentation and degradation if the Igua Ranch was developed. The protection of this tract would also further progress toward recovery in region 5 for the GCWA. The Service is relying heavily on the Balcones Canyonlands Preserve and the Refuge to meet population needs for at least one self-sustaining population for this region (Service 1992). While a large GCWA population with some level of protection has been identified for recovery region 6 (i.e., TPWD's Government Canyon State Natural Area and Camp Bullis population), none have been identified for recovery region 7 although that region contains the Kerr Wildlife Management Area, where a relatively small GCWA population is protected by TPWD.

Table 1. Total amount of GCWA habitat in acres by affected recovery region as estimated from a model developed by Duarte et al (2013).

Recovery Region	Estimated breeding habitat 2010-2011	Acres of breeding habitat affected by the project	Percent of breeding habitat affected by the project
5	482,542	785.1	0.16%
6	580,513	189.0	0.03%
7	413,639	660.2	0.16%
Total	3,899,963	1,634.3	0.04%

Houston toad

The Houston toad has been documented in Colorado and Lavaca Counties (Forstner and Dixon 2010, Buzo 2008), but no recent documented occurrences have been published within those counties. Buzo (2008) modeled Houston toad habitat throughout the species' range. Referencing the simple model, which relied on soil type and canopy cover, Buzo (2008) quantified the proportions of high, medium, low, and very low suitable habitat and areas where no habitat exists (Table 2). Within Colorado County, Buzo (2008) modeled approximately 43,623 acres (high quality); 68,551 acres (medium quality); 118,407 acres (low quality); and 311,599 acres (very low quality) of habitat. Within Lavaca County, Buzo (2008) modeled 49,678 acres (high quality); 136,614 acres (medium quality); 55,887 acres (low quality); and 260,809 acres (very low quality) of habitat. We note that the Buzo (2008) model is dated, and the current habitat conditions are likely less than those shown within the model. For example, overlaying the model on top of current imagery within the action area indicates the landscape has likely undergone changes since the model became available. Therefore, the amount of habitat currently present within Colorado and Lavaca counties is likely less than those proportions within the Buzo (2008) model. Despite the model being dated, it is a useful tool for preliminary analysis.

The Texas Natural Diversity database reports documented Houston toad locations approximately 9 miles south of the action area in Lavaca County and 19 miles north of the action area in Colorado County, and the Service has received information regarding Houston toad occurrences within 3.5 miles of the action area. The Applicant deployed passive acoustic monitors within the action area between January 8 and July 12, 2019. The acoustic data was analyzed by a Service permitted Houston toad biologist, and no identifiable Houston toad calls were identified throughout the 55,032 hours of recordings.

The Applicant also delineated areas of potential Houston toad habitat within the action area, based on the results of the Buzo (2008) model, refined by a review of current aerial imagery (SWCA 2019). The habitat delineation was limited to Colorado and Lavaca counties, since Houston toads are not known to occur in other counties within the action area. The Applicant delineated approximately 1,445.9 acres of potential Houston toad habitat within the action area. Construction will require the significant modification of 152.6 acres of potential Houston toad habitat due to vegetation removal and ground disturbing activities.

A 5-year status review of the Houston toad was completed in 2011 and 2018 (Forstner and Dixon 2011, Service, 2011, Service 2018) that assessed the status of the species throughout its range. Forstner and Dixon (2011) found that despite ongoing recovery efforts and attempts to encourage landowner participation in Houston toad recovery, consistent, incremental habitat loss, including forest clearing to allow for pasture conversion and development, is ongoing throughout the Houston toad's range. A population viability analysis conducted by Hatfield et al. (2004) concluded that a minimum of three connected, self-sustaining populations were required to prevent imminent extinction of the Houston toad. However, remaining Houston toad populations have become more geographically isolated (Buzo 2008; McHenry and Forstner 2009; Forstner and Dixon 2011). Most of the chorusing populations detected outside of Bastrop or Milam counties typically consist of 10 or fewer individuals (McHenry and Forstner 2009).

Dwindling population sizes have been largely attributed to habitat loss through destruction and fragmentation resulting from agriculture conversion of woodlands, urbanization, and fire suppression (Forstner and Dixon 2011). Unnaturally heavy fuel loads combined with historic drought conditions supported uncommonly intense and expansive wildfires in Bastrop County, Texas in 2009, 2011, and 2015. The results of burn severity analyses after the 2011 Bastrop County Complex Fire indicate that 49 percent of the burned area experienced a stand-replacing fire (a fire in which most or all of the overstory trees were killed) (Lost Pines Recovery Team 2011). Other threats such as predation, disease, competition, and hybridization are exacerbated as habitat loss continues throughout the range.

In combination with other threats, such as land use changes and urbanization, drought conditions in central Texas have likely played a role in reducing already small Houston toad populations to such low numbers of individuals that they are less able to recover (Forstner 2003). Low numbers of chorusing males recorded since 2000 compared to the numbers encountered in 1989-1990 may be the result of the mid-1990s drought (Price 2003). Drought conditions may have also affected Houston toad populations in Bastrop County in 2005 and 2006, as indicated by low numbers of Houston toads observed during survey efforts in 2006 (Forstner 2006). Beginning in September 2009, severe to exceptional drought conditions occurred in the central Texas region within the Houston toad's range. In March 2011, during what is typically the peak of the Houston toad's breeding season, central Texas received less than 0.10 inch (0.25 centimeters) of rainfall, making it the fourth driest March in the region since 1856.

Species experts have provided a wide range of estimates for Houston toad subpopulation and census sizes throughout the years. Only Bastrop County has been surveyed somewhat consistently since the 1970s; therefore, most of these estimates refer to Houston toad numbers in this county. In the 1980s, surveyors reported observing 30 to 1,000 Houston toads per breeding pond (Hillis et al. 1984). By 2003, Forstner (2003) estimated the number of Houston toads in Bastrop County to be between 100 and 200 individuals.

Table 2. The amount of modeled Houston toad high, medium, low, and very low quality habitat in acres throughout its known nine county range. Adapted from Buzo 2008.

County	High	Medium	Low	Very Low	Total
Austin	25,309	25,309	71,706	227,777	350,101
Bastrop	63,007	148,926	51,551	211,932	475,416
Burleson	13,003	60,679	39,008	294,728	407,418
Colorado	43,623	68,551	118,407	311,599	542,180
Lavaca	49,678	136,614	55,887	260,809	502,988
Lee	12,142	121,428	16,190	230,712	380,472
Leon	20,712	89,754	82,849	400,439	593,754
Milam	32,655	150,213	45,717	385,329	613,914
Robertson	44,301	132,903	66,452	293,495	537,151
Total	304,430	934,377	547,767	2,616,820	4,403,394

Tobusch fishhook cactus

The Applicant performed a field survey for the presence of TFHC within a 300-foot-wide corridor in Kimble County, the only county along the route of the pipeline where the species may

occur. The survey area contained approximately 1,383 acres across approximately 38 miles of the proposed pipeline that crosses potential TFHC habitat. TFHC surveys were conducted using Service-approved methodology which included:

- Surveys performed between January 22, 2019, and February 22, 2019, with a total survey effort of 1,400 person-hours.
- Field searches by biologists trained to identify TFHC, with particular attention to discriminating the difference between Tobusch and shorthook fishhook cactus subspecies.
- Searches used a wandering, visual encounter approach to focus efforts in areas of “high-probability” habitat, as determined in the field on the professional judgement of the surveyors, where high-probability areas are those that have exposed limestone outcrops with no more than scattered, smaller woody trees and shrubs, and little search time spent in areas with deeper soils, tall, dense grass, and canopy of taller trees, and steep slopes.
- The location of each TFHC or cluster of cactus individuals observed in the survey area was recorded with handheld global positioning system (GPS) receivers capable of 3.28-foot (i.e., sub meter) horizontal accuracy.

The Applicant documented 109 TFHC locations within the action area (Appendix B of the BA), with 16 of these individuals occurring within the USACE Action Areas and 93 individuals occurring within Applicant Action Areas. The documented population of TFHC in the action area represents a small percentage of the total documented population (2.4 percent of the approximately 4,500 documented individuals (Service 2017)).

V. EFFECTS OF THE ACTION

Effects of the action are all consequences to listed species or designated critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (50 CR 402.02, 402.17).

Other Provisions

Per the section 7 regulations (50 CFR 402.17(c)), the provisions in paragraphs ((a) (*activities that are reasonably certain to occur*)) and ((b) (*consequences caused by the proposed action*)) of this section must be considered by the action agency and the Service. Therefore, we discuss activities that are “reasonably certain to occur”, and “consequences caused by the proposed action” below.

Reasonably certain to occur

A conclusion of “reasonably certain to occur” must be based on clear and substantial information, using the best scientific and commercial data available. Factors to consider when evaluating whether activities caused by a proposed action (but are not part of the proposed

action) or whether activities reviewed under cumulative effects are reasonably certain to occur include: 1) past experiences with activities that have resulted from actions that are similar in scope, nature, and magnitude to the proposed action, 2) existing plans for the activity, and 3) any remaining economic, administrative, and legal requirements necessary for the activity to go forward.

Consequences caused by the proposed action

To be considered an effect of a proposed action, a consequence must be caused by the proposed action (i.e., the consequence would not occur but for the proposed action and is reasonably certain to occur). Considerations for determining that a consequence to the species or designated critical habitat is not caused by the proposed action include, but are not limited to: 1) the consequence is so remote in time from the action under consultation that it is not reasonably certain to occur, or 2) the consequence is so geographically remote from the immediate area involved in the action that it is not reasonably certain to occur, or 3) the consequence is only reached through a lengthy causal chain that involves so many steps as to make the consequence not reasonably certain to occur.

Required consideration

The Service does not anticipate any other activities that are reasonably certain to occur that are due to, and outside of those activities already presented within the BA. Those activities related to and discussed within the BA are considered reasonably certain to occur, and are anticipated to result in consequences impacting those listed species discussed herein. The construction of the PHP would not occur but for the Corps' issuance of the CWA Section 404 verifications for the project, and the construction of the PHP is reasonably certain to occur from the issuance of those verifications. The Corps and the Service have considered these activities, and their sub-activities and carry them forward within this formal section 7 consultation and BO.

Factors to be Considered

Golden-cheeked warbler

Proximity of the action

The PHP will occur within and adjacent to assumed occupied GCWA habitat along a 153.0-mile long corridor in Kimble, Gillespie, Blanco, and Hays counties. A total of 282.0 acres of GCWA habitat will be destroyed from project workspaces for construction of the PHP. The PHP will be constructed in GCWA recovery regions 5, 6, and 7 and will destroy or otherwise alter 144.7 acres, 28.3 acres, and 109.0 acres of GCWA breeding habitat, respectively. Of these 282.0 acres, 84.8 acres occur within defined USACE Action Areas while 197.2 acres occur within defined Applicant Action Areas (see Table 12 in the BA for more detail). An additional 300-foot buffer from either side of vegetation clearing, where consequential impacts stemming from habitat removal or modification are expected will occur in recovery regions 5, 6, and 7. The result is that, respectively, 640.4 acres, 160.7 acres, and 551.2 acres, totaling 1,352.3 acres may be adversely affected by the destruction of 282 acres of GCWA habitat for PHP construction. Of the 1,352.3 acres, 393.0 acres occur within USACE Action Areas and 959.3 acres occur within Applicant Action Areas. Total impacts will be to 1,634.3 acres of GCWA habitat.

Distribution

The GCWA is known to occur within the action area in Kimble, Gillespie, Blanco, and Hays counties. The Applicant has conducted a habitat analysis and confirmed those areas delineated as potential GCWA habitat by helicopter flyover. The 1,634.3 acres of delineated habitat within the action area is assumed occupied by the GCWA. Refer to Appendix A of the BA for a depiction of delineated GCWA habitat.

Timing and duration

The project will likely begin construction after formal consultation is concluded and the Corps has issued authorization. Project construction is expected to last approximately one year. Vegetation removal in GCWA habitat will occur outside of the GCWA breeding season to avoid impacts to individual GCWAs utilizing the 282.0 acres of habitat within project workspaces. Post-construction ROW vegetation maintenance is expected to occur on a routine basis, and to the maximum extent practicable, the Applicant will perform maintenance outside of the GCWA breeding season to avoid additional impacts to the species.

Nature of the effect

The project is expected to destroy or significantly modify 282.0 acres of GCWA habitat within project workspaces which include the 75-foot-wide temporary construction easement and the 50-foot-wide permanent easement. The 282.0 acres of impacts are considered permanent and habitat is not expected to recover to preconstruction conditions suitable as GCWA breeding habitat. The 1,352.3 acres adjacent to project workspaces will be negatively affected due to fragmentation and edge effects associated with the 282.0 acres of habitat loss. These consequences include, but are not limited to increased predation, noise effects, introduction of invasive species, increased competition, and other stressors that affect the feeding, breeding, and sheltering of the GCWA during the breeding season. Post-construction, the permanent 50-foot-wide easement will undergo routine vegetation management activities, but to the maximum extent practicable, will occur outside of the GCWA breeding season.

Disturbance frequency, intensity, and severity

A single major disturbance will occur to clear the 282.0 acres of GCWA habitat within project workspaces. All major vegetation clearing within the 282.0 acres will occur outside of the GCWA breeding season (March 1 to July 31). Construction activities within the ROW may occur during the GCWA breeding season but will not require vegetation clearing while GCWAs are in the area; thus, avoiding directly killing an individual. Construction activities and use of heavy machinery are expected to harm potential breeding GCWAs adjacent to project workspaces for any work conducted during the breeding season. Initial impacts due to habitat removal and construction are expected to last less than a year and will affect GCWAs in adjacent habitat for one breeding season. Post-construction consequences, such as flushing birds, could occur during operation and maintenance activities, if conducted during the breeding season.

Houston toad*Proximity of the action*

The PHP will occur within and adjacent to the approximate 20-mile corridor occurring within potential Houston toad habitat that is assumed occupied. A total of 152.6 acres will be destroyed within project workspaces for construction of the PHP. Of these 152.6 acres, 73.6 acres occur

within the defined USACE Action Areas while 79.0 acres occur in the Applicant Action Area. Given the 500-foot buffer from either side of vegetation removal and construction activities, expected consequential impacts stemming from initial habitat clearing will total 1,293.3 acres. Of these 1,293.3 acres, 578.9 acres occur in USACE Action Areas while 714.4 acres occur in Applicant Action Areas. Total impacts will be to 1,445.9 acres of Houston toad habitat. Houston toads have been documented within 9 miles of the project in Lavaca County, and within 19 miles of the project in Colorado County. Based upon the best available information, the 1,445.9 acres of negatively impacted habitat is only 0.03% of total modeled habitat throughout the species nine county range, and 0.12% of modeled habitat within Colorado and Lavaca Counties. The loss of this amount of habitat will not appreciably reduce the survival or recovery of the species because only a small percentage of the estimated total habitat in Lavaca and Colorado counties will be impacted by the pipeline, and no Houston toads were detected in the action area during surveys. The most recent estimate of habitat based on modeling indicates there are over 1,000,000 acres of potential Houston toad habitat in Colorado and Lavaca counties (see Table 2 above).

Distribution

The Houston toad has not been documented within the delineated action area, but is known to occur in Colorado and Lavaca Counties. The Applicant has conducted an analysis of potential Houston toad habitat and deployed audio loggers in an attempt to detect breeding Houston toads within delineated habitat with negative results. Given the presence of suitable Houston toad habitat and historic detections within at least 9 miles of the PHP, this portion of the project has potential to be occupied by the Houston toad in low numbers. Refer to Appendix A of the BA for the location of Houston toad habitat in Colorado and Lavaca counties.

Timing and duration

The project will begin construction after formal consultation is concluded and the Corps has issued authorization. Project construction is expected to last approximately one year. Vegetation removal and construction activities may occur during Houston toad breeding season with implementation of conservation measures detailed in Appendix D of the BA, and listed above within the description of the action. Conservation measures will be adhered to regardless of time of year as applicable during the construction phase or during operation and maintenance. Construction activities are expected to overlap with one Houston toad breeding season, and are expected to expose the species, if present, to construction activities. Exposure to stressors associated with construction are expected to harm both estivating Houston toads currently utilizing habitat within the ROW, and those dispersing toads in which project construction overlaps with the breeding season.

Nature of the effect

The project is expected to destroy or significantly modify 152.6 acres of Houston toad habitat within project workspaces which include the 50-foot-wide temporary construction easement and the 50-foot-wide permanent easement (the typical 75-foot ROW is reduced to 50-foot in Houston toad habitat). The 152.6 acres of impacts are considered permanent and habitat is not expected to recover to preconstruction conditions suitable for Houston toad occupancy, to include feeding, breeding, and sheltering in the future. Project construction will require the removal of canopy producing trees which provide shelter and cover from extreme heat and cold, and predators.

Project construction will also require significant earth moving activities (trenching) with heavy machinery and other vehicles that have the potential to kill, injure, and otherwise disturb toads sheltered belowground including animal burrows, under downed vegetation such as logs, and other forms of ground level shelter for the Houston toad.

With land owner permission, areas of habitat disturbance will undergo revegetation with native grasses and forbs consistent with typical Houston toad understory vegetation. However, if landowner permission is not granted, the potential for invasive species to establish in the area does exist. For example, if sod forming or mat forming grasses establish they may significantly impact adult and juvenile Houston toad movement and foraging. Houston toads are anticipated to continue to utilize those areas of suitable habitat outside of the 152.6 acres of project workspaces.

The area delineated outside of the 152.6 acres includes those 1,293.3 acres where Houston toads may experience consequential effects later in time due to the initial 152.6 acres of significant habitat modification associated with project construction; these effects include reduced dispersal to and from breeding locations, increased exposure to potential predators during dispersal, and increases to noise from vehicles and equipment associated with operation and maintenance activities. The 50-foot wide permanent easement is anticipated to act as a barrier to dispersing Houston toads during the breeding and emergence period which extends from January 1 to June 30. Removal of canopy producing trees increases the possibility of predation during Houston toad dispersal; thus decreasing the amount of juveniles and recruitment. Equipment and vehicles associated with operation and maintenance activities may disturb estivating toads in adjacent habitat, and have the potential to kill or injure toads during dispersal events.

Disturbance frequency, intensity, and severity

A single major disturbance will occur to clear the 152.6 acres of Houston toad habitat within project workspaces. Construction activities may occur during the Houston toad breeding season, but will require the full implementation of the conservation measures detailed in Appendix D of the BA to avoid and minimize the severity of impacts to the species. If construction is completed on time (October 2020), the species will be exposed to construction activities during one Houston toad breeding season. Post-construction impacts and consequences are anticipated to occur in the form of harm due to post-construction operation and vegetation management. Harm is primarily expected to occur when or if operation and maintenance activities requiring the use of machinery and vehicles overlaps with the Houston toad breeding season; this may include the use of loud mowing equipment and vehicles which are expected to expose Houston toads to stressors associated with noise and vibration. The potential for harm to Houston toads due to operation and maintenance activities also exists if there is overlap with the breeding season. Dispersing adults and juveniles may attempt traversing the 50-foot wide permanent easement where operation and maintenance will occur, and may be exposed to equipment or vehicles that may crush or injure the species.

Tobusch fishhook cactus

Proximity of the action

The PHP will occur within and adjacent to potential TFHC habitat along an approximate 38-mile corridor totaling 1,383 acres in Kimble County. Within the 300-foot wide study corridor (the

area where TFHC surveys occurred in suitable habitat) a total of 109 TFHC individuals were located. Of the 109 individual TFHC, 16 were within USACE Action Areas while 93 were within Applicant Action Areas. Within project workspaces where construction will occur, 6 and 36 individual TFHC were located within USACE Action Areas and Applicant Action Areas, respectively.

Distribution

The TFHC is known to occur within Kimble County, Texas. The Applicant performed presence/absence surveys and located 109 TFHC individuals within the action area. Reference Appendix A of the BA for a depiction of delineated habitat and TFHC locations within the Action Area.

Timing and duration

The project will begin construction after formal consultation is concluded and the Corps has issued authorization. Project construction is expected to last approximately one year. Post-construction vegetation management of the 50-foot permanent easement will occur periodically, and has the potential to affect reestablishment or colonization of any suitable remaining habitat. However, any destroyed habitat within the permanent 50-foot ROW is not anticipated to recover to suitable conditions for the TFHC. Those areas requiring temporary construction easements may remain suitable for TFHC recolonization after construction activities have been completed, and are not expected to be exposed to operation and maintenance activities as they would be outside of the permanent 50-foot easement.

Nature of the effect

The proposed project is anticipated to directly affect 42 TFHC. Of these 42 cacti, 6 occur within USACE Action Areas, and 36 occur within Applicant Action Area. All 42 TFHC will be removed (salvaged), in accordance with the research agreement between the Applicant and Angelo State University dated April 30, 2019. Angelo State University will conduct research on the salvaged cacti, and reintroduce them into suitable habitat at a later date. The remaining 67 cacti outside of the project workspaces (outside areas where construction activities will occur) will not be removed as project activities will not extend into these areas. Long term negative effects due to reduced potential for genetic dispersal may occur as a result of the removal of 42 cacti immediately adjacent to those cacti which will remain in place; thus outcrossing potential may be reduced and loss of genetic diversity at these locations may occur.

The remaining 67 cacti are not expected to experience any long term negative effects as operation and maintenance activities will be restricted to the 50-foot permanent easement; thus exposure to equipment and vehicles after construction activities is not expected to occur. Although many cacti will be salvaged, it is possible some were missed during presence/absence surveys. It is also possible that the cactus will recolonize some disturbed areas within the project workspace. Any cacti missed or those that may recolonize the permanent easement have the potential to be crushed during routine ROW vegetation management and pipeline maintenance. All access to these activities will be limited to the permanent ROW easement and will only use the minimum amount of driving area to complete activities. Mowing will be minimal, if at all, within TFHC habitat as the terrain is rocky, rough, and restricts certain types of practices such as mowing. Herbicides will be used, but application will be restricted to "spot spray" with no

aerial or broadcast applications; this will minimize any potential for herbicide to “drift” and expose remaining or recolonizing TFHC to herbicide effects.

Disturbance frequency, intensity, and severity

A single major disturbance to clear vegetation within project workspaces will occur, and 42 TFHC will be removed prior to this disturbance to avoid direct mortality as a result of construction activities. After construction, areas within the maintained ROW may continue to be suitable habitat and may be recolonized after some time. However, areas where trenching is expected to occur within TFHC habitat may not be suitable for recolonization in the foreseeable future. Routine ROW vegetation management and pipeline maintenance will occur, and conservation measures will be followed during these activities to minimize the intensity of any potential effects to cacti and potential habitat that may be recolonized. All 42 cacti occurring within the project workspace will experience initial stress due to removal and salvage operations, but some are anticipated to survive salvage, research, and reintroduction efforts and reproduce at a later time; thus minimizing severity. Those remaining 62 TFHC may experience reduced reproductive potential and gene flow given the removal of 42 cacti (potential outcrossing sources) from adjacent construction areas.

Analyses for Effects of the Action

Golden-cheeked warbler

The project will destroy 282.0 acres of GCWA habitat in Kimble, Gillespie, Blanco, and Hays counties. As a consequence of the removal of 282.0 acres of habitat, this area will no longer function as potential GCWA breeding, feeding, sheltering, and nesting habitat in the future. When considering the species’ breeding site fidelity, any GCWA breeding pairs which may have used any portion of the 282.0 acres in past breeding events will have to relocate and potentially compete for other suitable breeding habitat. If breeding birds cannot find other suitable habitat, it is reasonable to assume successful breeding will not occur; thus recruitment will not occur.

GCWA breeding in territories with less forest edge have been shown to have higher rates of pairing success and nest survival as opposed to those with increased edge and reduced patch size (Coldren 1998, Peak 2007, Groce et al. 2010). Coldren (1998) showed that GCWA tend to place territory centers further from edges with distances varying by edge type. Edge types were classified as “hard” if width was 10 feet or greater, and “soft” if width was less than 10 feet. The 1,352.3 acres within the 300-foot buffer adjacent to the 282.0 acres of habitat that will be destroyed by the action are anticipated to continue to support GCWA breeding and nesting, but at a lower capacity because of the increased amount of hard edge, and the likelihood of GCWA moving further from that edge to establish territory centers. Peak (2007) showed GCWA survival on Fort Hood varied depending on the amount of edge habitat, and determined period survival was greater in patches with less edge to habitat ratios (50 percent survival) versus those with more edge to habitat ratios (17 percent survival).

Those activities associated with construction after the initial clearing of habitat (i.e. trenching, heavy machinery use) are reasonably certain to occur during the GCWA breeding season, and we anticipate consequences to GCWA habitat due to construction effects during that time. Noise from operating heavy machinery in the vicinity of occupied GCWA nesting habitat is expected to

We note that GCWA habitat is not contiguous along the entire 153-mile proposed action corridor, and is only present in discrete patches (Figure 4). The degree of impacts stemming from increased fragmentation on existing habitat patch size will vary along the PHP corridor and depends on: 1) habitat patch size, 2) the extent the PHP intersects any particular patch, and 3) the amount of existing fragmentation already affecting any particular patch. In general, we anticipate larger intact patches to be affected more due to fragmentation (i.e. experience less reproduction/nest success/survival due to increased edge to patch size ratio), and those already highly fragmented patches to be affected less.

[illegible]

A qualitative assessment of Appendix B of the BA shows that the majority of the existing habitat within and adjacent to the action area is fragmented and experiencing edge effects from existing roads, utility easements, and agricultural. Post construction consequences associated with the 282.0 acres of cleared edge are reasonably anticipated to reduce some habitat patches to the extent they are not optimal for breeding and nesting success, increase risk of predation, reduce

foraging opportunities, and may expose GCWA to stressors associated with operation and vegetation management activities. To avoid and minimize impacts to the GCWA, the Applicant will implement conservation measures discussed in Table 3 of the BA and within the description of the action above. These conservation measures include seasonal clearing restrictions; conducting vegetation management outside of the GCWA breeding season, when possible; and voluntary conservation measures associated with the protection of 1,363 acres of occupied GCWA habitat (Igau Ranch) in recovery region 5 located in Travis County, Texas.

Seasonal clearing restrictions offer the best method to minimize harming GCWAs that would otherwise occur during habitat destroying activities. By not being present during the habitat clearing activity, individuals are not affected by noise, collision with equipment, or displaced after having started breeding activities. Thus, birds are protected from being killed, injured, or have their reproduction disrupted. The preservation of land is the best method for minimizing long-term harm to the species and addressing the threat faced by the species from loss and fragmentation of habitat. Golden-cheeked warbler breeding habitat cannot be created or restored in a meaningful timeframe. The mature woodlands used by the species takes decades to grow. Absent the option to grow or restore habitat, protection of high quality habitat is the best approach for conservation of breeding habitat over the long-term. The purchase and ultimately the donation of the Igau Ranch to the Balcones Canyonlands National Wildlife Refuge allows for this large tract of habitat to be added to lands already owned and managed by the Refuge.

One of the ways that conservation of this property benefits the species is that it is a large property (the Service (2013) requires a minimum of 500 acres of habitat for GCWA conservation banks and mitigation properties) and, in combination with the surrounding properties already owned by the Refuge, it enlarges the contiguous habitat that is under the protection and management of the Service. Large, contiguous areas of high quality habitat have less habitat edge (i.e., fragmentation), which means individuals are less likely to be affected by disturbance including those caused by noise and predators. The conservation of larger habitat areas is also beneficial for the species because where smaller, fragmented, and, therefore, lower quality habitat with a lower density of GCWAs is lost to development, individuals will have access to high quality habitat that will be reliably available every year. The Service considers the species able to tolerate the loss of poorer quality habitat when offset with larger acreages of permanently protected high quality habitat. This is the concept that underlies the habitat conservation banking strategy which the Service approves of under the requirements established for GCWA habitat conservation banks and mitigation lands (Service 2013). Warblers are known to return to territories where they were successful. Having permanently protected habitat secures their long-term breeding potential. Warblers that may be displaced from breeding habitat in the action area are not expected to relocate to the Igau Ranch. It is expected that displaced birds will search for breeding habitat wherever suitable habitat may be found. Golden-cheeked warblers are known to return to breeding territories especially if they are successful and also to disperse longer distances (Reidy et al. 2018). We expect birds that may have been nesting in the action area will, upon finding the habitat destroyed or degraded, search for other available nesting habitat.

Houston toad

The project will result in the destruction of 152.6 acres of Houston toad habitat due to removal of overstory vegetation and ground disturbing activities in Colorado and Lavaca counties; this will

occur in segments along an approximate 20-mile corridor where the PHP crosses Houston toad habitat (Figures 5 and 6). As a consequence of the significant modification of 152.6 acres of Houston toad habitat, we can reasonably anticipate this area will no longer function as suitable habitat for the Houston toad. The action of removing canopy producing trees will effectively remove an essential component of Houston toad habitat. Ground disturbing activities will require the use of heavy machinery and trenching equipment capable of killing, injuring, or harming Houston toads to the point of site abandonment. Removal of canopy cover, dead and down woody vegetation, animal burrows, and other forms of cover, removes shelter and concealment exposing Houston toads to the elements and increasing the potential for predation.

The Applicant used a 500-foot buffer on either side of the 100-foot-wide area consisting of the project workspaces to determine the area of potential effects to Houston toads. Houston toads occupying the total of 1,293.3 acres of Houston toad habitat are anticipated to be affected by consequences associated with the initial 152.6 acres of habitat destruction. Houston toads within the 1,292.3 acres may experience consequences that affect dispersal resulting from the adjacent clearing of 152.6 acres of habitat; this 152.6 acres of cleared habitat may act as a barrier to and from breeding sites and during dispersal of emerging Houston toad juveniles. Houston toads within the 1,293.3 acres may also experience an increase to predation exposure due to edge effects and increased habitat fragmentation presented by the 152.6 acres of habitat destruction.

Figure 5. Example of a segment of delineated Houston toad habitat along the PHP corridor. This habitat exists within a highly fragmented landscape.

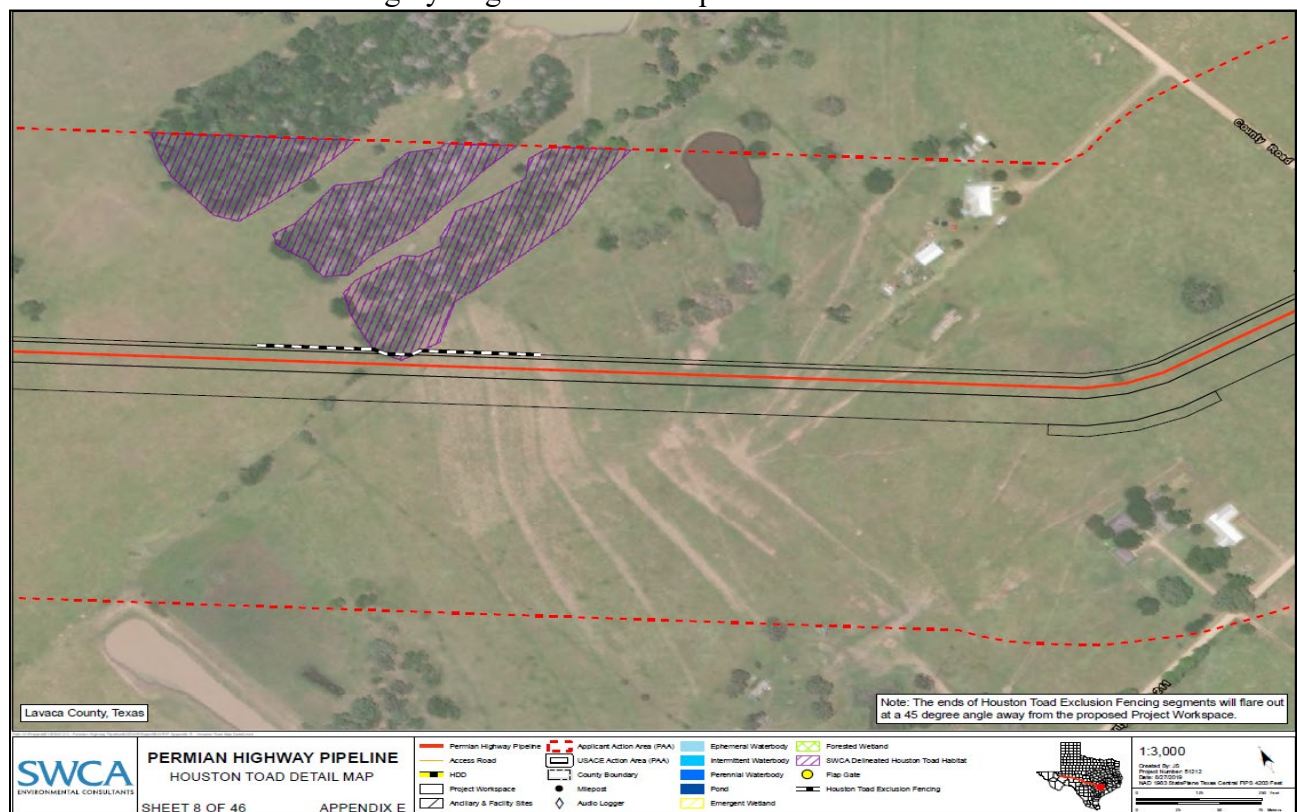
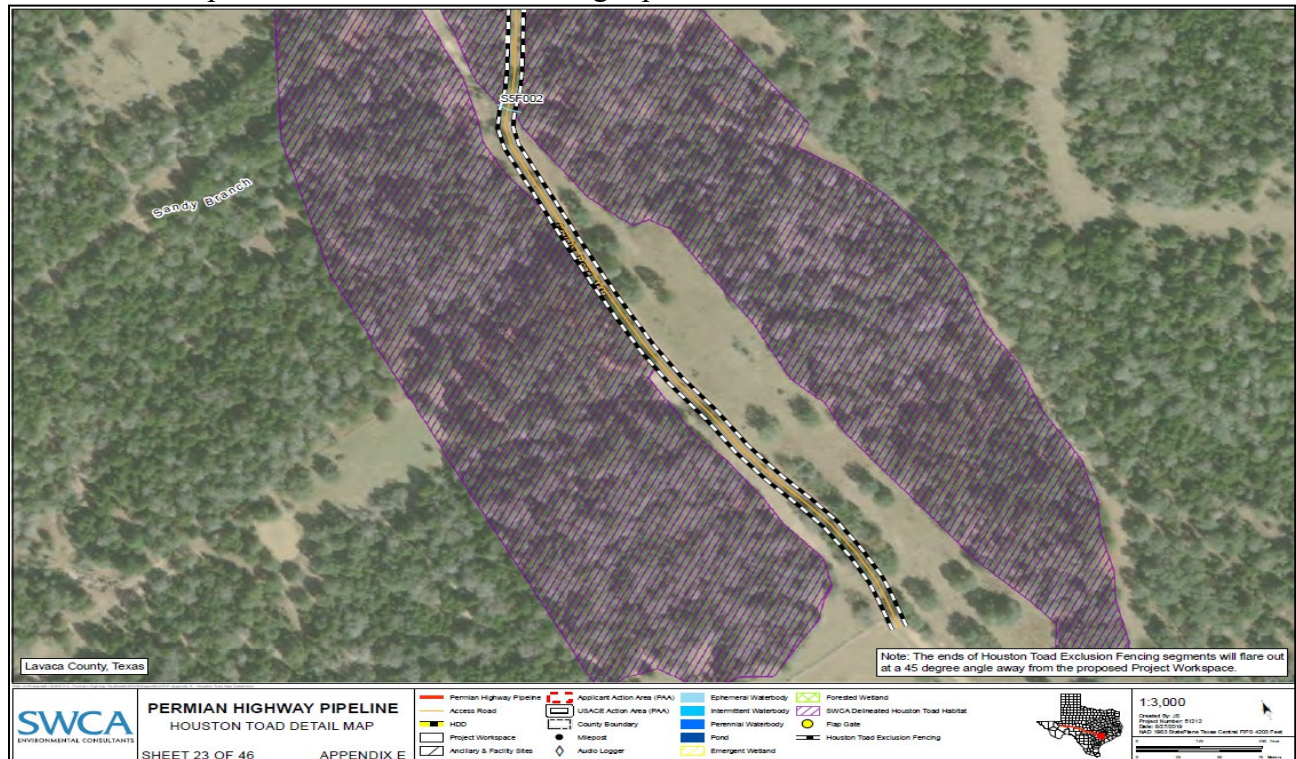


Figure 6. Example of a segment of delineated Houston toad habitat within the PHP corridor. This is an example of an area that contains larger patches of habitat.



Forage productivity (arthropods such as carabids, dipterans, lacewings, and moths) may decrease in disturbed areas resulting in less food available for Houston toads in the action area. Invasive species, both plants and fire ants, are known to colonize disturbed areas, and may affect the Houston toad after project completion; for example sod or mat forming grasses may act as significant barriers to dispersing toads. Fire ants are known to predate juvenile toads (Freed and Neitman 1998). The introduction of loud noises, lights, and vibrations adjacent to toad habitat could cause the species to avoid the area of disturbance and disrupt breeding activity. Post-construction operation and maintenance, such as vegetation management, and use of vehicles within the maintained 50-foot ROW may harm dispersing Houston toads by crushing during the breeding season, and or cause the species to avoid the area completely, disrupting dispersal of adults and emerging juveniles.

To avoid and minimize impacts to the Houston toad the Applicant will implement conservation measures detailed in Appendix D of the BA and discussed in the description of the action above. Conservation measures include the use of a 10(a)(1)(A) Service permitted Houston toad biologist to act as a toad monitor during project construction, and the use of fencing designed to keep Houston toads out of excluded areas within project workspaces. The Applicant will also donate \$1,050,000 to the Texas Research Incentive Program (TRIP) to be used for Houston toad research and recovery including, but not limited to, surveys, studies, captive breeding, establishing conservation easements and habitat purchases. This donation will be matched by TRIP at a 0.75:1 ratio, increasing the available funds to support Houston toad conservation efforts to \$1,837,500.

The funding will benefit the species when used to fund conservation and research projects. Headstarting gives individuals a greater chance of surviving to reproductive age. Surveys and researching new information to inform management and recovery of the species will close gaps in our knowledge of the species biology and distribution. These valuable efforts do not directly mitigate harm that may come to Houston toads in the action area, but the activities that are funded increases the potential for the species to survive and recover through protected habitat and better recovery strategies.

Tobusch fishhook cactus

Removal of 42 TFHC will occur in the form of collecting (salvaging) in Kimble County. The total documented population of the TFHC within its surveyed range was 4,500 as of 2015, and has increased to approximately 4,960 individuals given survey results from recent section 7 consultations. Approximately 3,900 of those individuals are on protected lands such as those managed by TPWD, TNC, and Texas Land Conservancy. Including the survey results conducted as part of the proposed project, the number of documented TFHC individuals rises to approximately 5,070. The total estimated range-wide population is calculated at approximately 480,000 cacti, but this is only the best estimate based on current quantitative data and may be an overestimate (Service 2017).

As part of the agreement between the Applicant and Angelo State University, the 42 cacti will be salvaged prior to ROW clearing and construction. The 42 salvaged cacti account for a small amount, 0.83 percent, of the total documented (5,070) individuals in Bandera, Edwards, Kerr, Kimble, Kinney, Real, Uvalde, and Val Verde (Poole et al. 2007), and significantly less, 0.009 percent, of the estimated range-wide population. Based on previous salvage efforts conducted as part of four section 7 consultations, we can assume some salvaged individuals will survive salvage/reintroduction and may be able to reproduce. There is a possibility that some portions of habitat not permanently altered by project activities may be recolonized over time, as only a portion of the ROW clearing will include activities that will permanently alter habitat such as trenching and road construction. Project activities will not extend past the project workspaces. Areas outside of the project workspace will be avoided, and the project is not anticipated to affect the remaining documented 67 cacti.

VI. CUMULATIVE EFFECTS

Cumulative effects are those “effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area” considered in this BO (50 CFR 402.02).

According to the BA, approximately three single family homes are expected to be constructed within the action area in the City of Kyle, Texas. The Service is not aware of any other future state, tribal, local, or private actions that are reasonably certain to occur within the action area at this time. Within the greater plan area (southwest Texas) oil and gas production which may include drilling sites, pipelines, and pipeline expansions will likely continue to occur. Due to the abundant shale plays (shale formations containing accumulations of natural gas) in the Permian Basin of west Texas, oil production will likely continue, and may undergo similar federal regulatory reviews. It is also important to note that future pipelines may co-locate and could occur parallel to the PHP; this practice has been observed in previous section 7 consultations, to

include construction of the Epic Pipeline (02ETAU00-2018-F-1531), and is likely to continue where possible. Although the Service is unaware of any future projects of similar scope and background planned within the action area, the possibility for future similar projects to collocate with PHP does exist. This area is not anticipated to experience large human population growth or expansion in the future.

VII. CONCLUSION

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Our analysis relies on 4 components: (1) Status of the Species, (2) Environmental Baseline, (3) Effects of the Action, and (4) Cumulative Effects. The jeopardy analysis in this BO emphasizes the range-wide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

After reviewing the status of the GCWA, Houston toad, and TFHC, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is the Service’s biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of these species. No designated critical habitat is located within the action area; therefore, none will be affected.

Although the consequences of the proposed action may compound those existing factors affecting the aforementioned species, we do not anticipate a reduction in the overall reproduction, numbers, and distribution to the point of jeopardizing their continued existence and recovery as a result of implementing the proposed project. We discuss the rational per species below.

Jeopardy Analysis

Golden-cheeked warbler

The proposed project will result in the destruction of 282.0 acres of GCWA habitat. Additionally, breeding GCWA in the 1,352.3 acres that make up the area within the 300-foot buffer are anticipated to be degraded because of increased edge effects, habitat loss, and fragmentation; thus, long-term exposure to stressors associated with edge effects include reduced breeding success and nest survival, reduced foraging, reduced patch size, increased exposure to predators due to loss of canopy cover and increased edge effects, and reduced amount of available nesting habitat and nesting material.

To avoid and minimize impacts the Applicant will implement avoidance and minimization measures discussed in Table 1 of the BA and the description of the action in this BO. The Applicant will not conduct vegetation clearing during the breeding season; thus, avoiding any potential to kill breeding adults, fledglings, or eggs. The Applicant will also conduct ROW vegetation management outside of the breeding season to the maximum extent practicable, which further reduces exposure to stressors from operation and maintenance activities to any GCWA

occupying adjacent habitat. As part of any vegetation clearing or maintenance, the Applicant will implement measures to avoid the spread of oak-wilt and the potential for the pathogen to further degrade adjacent GCWA habitat.

Furthermore, delineated GCWA habitat within the action area is of varying levels of suitability for GCWA reproduction; this is based on the review of geospatial information provided within the BA which depicts different levels of fragmentation within and near the action area, and we do not believe all habitat present within the action area to be of optimal suitability. However, the entirety of that habitat occurring within the action area is assumed occupied, but this assumption is likely an overestimate given the fragmented condition of intersected patches within the action area.

The Applicant will minimize impacts to the species and provide benefits for the species recovery through the permanent protection of 1,363 acres of occupied GCWA habitat within recovery unit 5 and adjacent to the Balcones Canyonlands National Wildlife Refuge in Travis County, Texas. The primary purpose of the Refuge is to protect the nesting habitat of the GCWA and the black-capped vireo. Management of the property will be merged with the management of the Refuge including monitoring, fencing, feral hog trapping, oak wilt monitoring, and other habitat improvement efforts, according to a management plan developed by the refuge. In April of 2019, the Service conducted surveys across four days following Service protocol, and GCWA were documented across the property. Service (2019b) conducted an analysis and estimate that approximately 146 GCWAs were using or immediately adjacent to the property on other refuge tracts (Service 2019b).

Although, 1,634.3 habitat acres will be destroyed or degraded, only 282 of that total will occur due to habitat destruction. The remaining 1,352.3 acres of impacts will be due to habitat degradation. If we apply mitigation ratios consistent with Service practice for the GCWA of 2:1 (the ratio generally used for medium quality habitat) for habitat destroyed and 0.5:1 for habitat degraded, the total amount of land needed to fully offset impacts to the species would be 1,240.15 acres. Therefore, perpetual preservation of 1,363 acres of GCWA habitat in recovery unit 5 is anticipated to fully offset impacts to the species. The Applicant has purchased these 1,363 acres and will convey them to the Refuge within six months of authorization by the Corps. This land will be managed by the Refuge and contribute to the protection of a large contiguous portion of occupied GCWA habitat that is managed for long-term conservation, consistent with the recovery plan for the species.

Impacts to GCWA feeding, breeding, and sheltering will be in large part due to the initial stressors associated with habitat removal, and construction of the PHP for a period not to exceed one GCWA breeding season. Post-construction operation and maintenance activities will occur within the cleared and maintained portion of the ROW limited to a width of 50 feet, and given these restrictions to areas already void of habitat, the operation of the PHP is not expected to result in additional impacts not already considered within this BO.

Therefore, given: 1) the likelihood of existing habitat within the action area not being optimal GCWA breeding habitat; 2) the limited duration of exposure to stressors related to construction; 3) the limited duration and limited severity of exposure to stressors related to operation and

maintenance; and 4) the binding commitment to fully offset impacts by purchasing and perpetually protecting 1,363 acres of occupied GCWA habitat prior to project implementation, the Service does not expect, directly or indirectly, that the proposed project will reduce appreciably the likelihood of both the survival and recovery of the GCWA in the wild by reducing the reproduction, numbers, or distribution of GCWA.

Houston toad

The proposed project will result in the destruction of 152.6 acres of Houston toad habitat. These 152.6 acres will no longer function as suitable or optimal habitat capable of supporting Houston toad feeding, breeding, and sheltering. Houston toads occupying the 1,293.3 acres (500-foot buffer area) are anticipated to experience long-term negative impacts due to edge effects resulting from the destruction of 152.6 acres of Houston toad habitat. These consequences may include reduced foraging, reduced dispersal, increased predation, and reduced reproduction and recruitment.

To avoid and minimize impacts the Applicant will implement avoidance and minimization measures discussed in Appendix C of the BA and within the description of the action in this BO. The Applicant will narrow ROW construction width, and will limit all construction activity within Houston toad habitat to those areas which have been cleared by exhaustive searches conducted by Service-permitted 10(a)(1)(A) biologists. All construction within Houston toad habitat will occur within the bounds of installed wildlife fencing designed to exclude Houston toads from entering the construction area; thus, avoiding the potential for crushing or injuring dispersing adults or juveniles during pipeline construction. Construction entrances will be limited to the least amount necessary, and these entrance/exit points will have installed gates designed to exclude and reduce the risk of crushing Houston toads at these access points.

Post-construction operation and maintenance activities will be limited to the 50-foot permanent ROW. Mowing of the ROW will be limited to a biannual schedule at a set height of 12 inches to minimize the potential to kill or injure any Houston toads which may be within the maintained ROW. If wildfire conditions exist during scheduled mowing, then vegetation management will be postponed until conditions pose less risk of causing a wildfire. All herbicide application for vegetation management will be conducted by hand (i.e. spot spray) to avoid the potential for chemicals to drift. No broadcast application of herbicides will occur within or adjacent to Houston toad habitat; thus avoiding any direct consequences to the Houston toad or habitat adjacent to the maintained ROW. If landowner permission is granted, the Applicant will revegetate impacted areas with native seed mixes to minimize the potential for invasive plants to establish.

The Applicant conducted Houston toad surveys as part of this project with negative results, meaning no toads were detected. Additionally, the Applicant deployed audio loggers along the PHP corridor occurring within or adjacent to delineated habitat with negative results. The Service also notes the level of habitat quality within the PHP corridor varies, and those existing patches of delineated Houston toad habitat occur within fragmented agricultural landscapes. Based on the images provided within the BA, the proposed project occurs immediately adjacent to existing roads and cleared easements along many segments where delineated habitat exists; thus, the delineated habitat is already exposed to consequences associated with the existing level

of edge and fragmentation. Although the amount of edge and fragmentation will increase due to PHP construction, the severity of consequences due to increased edge will be less in those areas which are already fragmented. For those few segments where the PHP bisects intact habitat (i.e. areas where no roads or cleared easements exists), the severity of consequences from new edge and fragmentation are expected to be greater. The entirety of habitat occurring within the action area, regardless of varying levels of quality and fragmentation, are conservatively considered occupied by the Houston toad and avoidance and minimization measures will be implemented throughout.

In addition to implementation of the avoidance and minimization measures the Applicant will also minimize impacts by voluntarily contributing \$1,050,000 to the Texas Research Incentive Program (TRIP) to be used for Houston toad research and recovery including, but not limited to, surveys, studies, captive breeding, purchasing habitat, and establishing conservation easements for the benefit of the Houston toad. The activities funded through this contribution will increase our understanding of the location and the number of Houston toads in the wild, increase the number of toads bred in captivity which insures that species will not go extinct, and habitat protected will insure the species continues to have space for breeding, feeding, and sheltering. While the Service has considered and appreciates the Applicant's commitment, such commitment is not required to support our conclusion of no jeopardy. Based on the Service's understanding of the status of the Houston toad and the adverse effects of the project, such adverse effects are not likely to appreciably diminish the likelihood of survival and recovery of the species in the wild regardless of the implementation of this measure, because the avoidance and minimization measures are adequate to ensure that the species is not jeopardized by the proposed action.

Impacts to Houston toad feeding, breeding, and sheltering will be due to the initial stressors associated with survey efforts to relocate any Houston toads found within the limits of construction, and the destruction of 152.6 acres of potential Houston toad habitat for a period not to exceed or overlap with more than one Houston toad breeding season. Post-construction operation and maintenance activities will be limited to the 50-foot ROW and will be conducted in accordance with avoidance and minimization measures; thus, the operation of the PHP is not expected to result in additional consequences not already considered within this BO.

Therefore, given: 1) the negative Houston toad survey and audio logger results; 2) the varying level of existing and segmented habitat quality within an already fragmented landscape along the PHP corridor, 3) the limited duration and limited severity of exposure to stressors related to construction; 4) the limited duration and limited severity of exposure to stressors related to operation and maintenance, and 5) the full implementation of avoidance and minimization measures, the Service does not expect, directly or indirectly, the proposed project will reduce appreciably the likelihood of both the survival and recovery of the Houston toad in the wild by reducing the reproduction, numbers, and distribution of the species.

Tobusch fishhook cactus

The documented total population of TBHC as of 2015 is approximately 4,500 individuals, with an extrapolated estimate for worldwide numbers around 480,000 individuals (Service 2017).

The Applicant has identified 42 TFHC within project workspaces and has agreed to remove and salvage these cacti prior to construction activities. The collected individuals will be transferred to Angelo State University for research and reintroduction into suitable habitat. The 42 salvaged cacti account for a small amount, 0.83 percent, of the total documented (5,070) individuals in Bandera, Edwards, Kerr, Kimble, Kinney, Real, Uvalde, and Val Verde (Poole et al. 2007), and significantly less, 0.009 percent, of the estimated range-wide population. The proposed action will not jeopardize the continued existence of TFHC because the documented population is large relative to the loss from the proposed action. Plants that would otherwise be killed during the project will be collected and could be relocated to suitable habitat. Once planted in a new location they could survive and reproduce, although we cannot be certain of any future reproduction from these individuals. We assume as a worst case scenario that all 42 plants will die. Even under this conservative scenario, the species will still have the potential to survive and recover due to the continued reproduction of the overall population, including some populations on protected properties such as state parks.

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plants species. However, limited protection of listed plants is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed endangered plants from areas under federal jurisdiction or the malicious damage of such plants on such areas, or the destruction of endangered plants on non-federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law. The State of Texas listed TFHC as endangered on April 29, 1983. Commercial permits are required for the commercial use of listed plants collected from private land in Texas, and scientific permits are required for collection of endangered plants or plant parts from public lands for scientific or education purposes. However, no provisions, state or federal, protect the TFHC on private lands. Therefore, no Incidental Take Statement for this species will follow.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined by the Service as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harass is further defined by the Service as an intentional or negligent act or omission which creates the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include, but are not limited to, breeding, feeding and sheltering (50 CFR §17.3). Harm is also further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by impairing behavioral patterns, including breeding, feeding, and sheltering. Incidental take is defined by the Service as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking by the Corps and/or the Applicant (PHP, LLC.) that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act, provided that such taking is in compliance with this Incidental Take Statement. See also, 50 C.F.R. § 402.14(i)(5) (stating that any taking that is “in compliance with the terms and conditions of that [ITS] is not prohibited taking under the Act, and no other authorization or permit under the Act is required.”); § 402.02 (defining incidental take as “takings that result

from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant.”).

The measures described below are nondiscretionary and must be implemented by the U.S. Army Corps of Engineers (Corps) and/or the Applicant (Permian Highway Pipeline, LLC.), as applicable. With respect to the USACE Action Area, the Corps must make the measures described below that are applicable to the USACE Action Area binding conditions of any authorization issued by the Corps to implement the project covered by this biological opinion. The Corps has a continuing duty to regulate the activity covered by this incidental take statement within the Corps’ Action Area. For the Corps Action Area, if the Corps (1) fails to adhere to the terms and conditions of the incidental take statement through enforceable conditions that are added to the authorizations, and/or, (2) fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) for the Corps and the Applicant may lapse. In the Applicant Action Area, the Applicant has a continuing duty to comply with the measures described below, in order for the exemption in section 7(o)(2) to apply to the Applicant’s project activities in that area. Due to the Corps limited jurisdiction over the project, the Service will assume responsibility for compliance monitoring and enforcement of the Applicant Action Area; however the Applicant should include the Corps in all monitoring and enforcement communications. To monitor the impact of incidental take, the Corps and Applicant must report the progress of the action and its impact on the species to the Austin Ecological Services Field Office as specified in the incidental take statement. [50 CFR 402.14(i)(3)]. This biological opinion and incidental take statement do not become effective for the Corps or the Applicant until the Corps issues all required CWA authorizations for the project.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The effects of the action may result in incidental take of individual golden-cheeked warblers (GCWA) and Houston toads that occur or otherwise utilize potential habitat within the Project Analysis Area. Our take analysis for the GCWA expresses the amount of take using habitat as a surrogate. The amount take for the Houston toad is calculated as individuals (i.e. not using habitat as a surrogate). Houston toad take calculations are based on our density estimates for the species and is further discussed below.

Incidental take that may occur as a result of the Proposed Project would most likely be in the form of harm via habitat modification or habitat loss for the GCWA and the Houston toad. The precise number of GCWA that may be harmed by the proposed pipeline are unknown and are difficult to determine, and the Service uses acres of potential GCWA habitat as a metric for estimating the amount or extent of incidental take of the warbler herein. Below, the Service provides a basic overview of the surrogate used for golden-cheeked warblers. A more detailed explanation of the surrogate analysis for the GCWA may be found in the Corps’ BA. In the BA, potential incidental take for the Houston toad was assessed both in terms of an estimate of individuals and in terms of the number of acres of potential Houston toad habitat that may be directly affected by the proposed project. The Service has considered both approaches. While use of a surrogate, as explained in the BA, may also be appropriate, in this instance and based on the Service’s experience with similar projects, we proceed with an estimate of individuals.

The Service has used habitat as a surrogate for incidental take of individual GCWA in numerous consultations under section 7 of the Act. It is not practical to estimate the number of warblers to be taken for the following reasons: The species is cryptic and difficult to detect and is only present throughout its breeding range at specific times of year making it difficult to conduct presence/absence surveys except during the limited time when the species is on the breeding range. Use of a habitat as a surrogate is rationally linked to actual take of GCWA caused by the proposed pipeline, as described in greater detail in section 4.1.5 of the Corps' BA.

Finally, the use of GCWA habitat as a surrogate for take provides measurable guidelines for the Service to determine when authorized incidental take would be exceeded. Take of GCWA may be expressed by loss of 282 acres of warbler breeding habitat and degradation of 1,352.3 acres of adjacent habitat. The loss and degradation of habitat is anticipated to be significant to the point that harm of GCWA, and impairment of essential behavioral patterns are reasonably certain to occur; these include reduction of feeding, breeding, and sheltering resources for the species in the affected project areas. The anticipated take is described in Table 3 below.

Table 3. Anticipated take for the GCWA.

Project Area	Amount of Take (acres)	Life Stage when Take is Anticipated	Type of Take	Take is Anticipated as a result of
In USACE Action Area	84.8 acres total loss and 393.0 acres degraded	Adults and juveniles	Harm	Reduction of fitness to individuals by impairing breeding, feeding, and sheltering activities caused by the loss and degradation of habitat.
In Applicant Action Area	197.2 acres total loss and 959.3 acres degraded	Adults and juveniles	Harm	

The amount of individual Houston toads anticipated to be taken as a result of the proposed action is based on information provided by Duarte et al. (2011). Duarte et al. estimated the entire Houston toad adult population on the Griffith League Boy Scout Ranch (GLR) in Bastrop County to be between 241 and 368 individuals on approximately 4,820 acres. Based on Duarte et al. (2011) we calculated the density of Houston toads to be 0.050 to 0.076 toads per acre. We are unable to determine density or absolute numbers of emerging juveniles which may be present on the landscape, as these numbers likely fluctuate widely and require further scientific study.

We relied on Duarte et al. (2011) because it provides data on which to make an estimate of the number of individuals present in the action area. However, it is important to note the information presented by Duarte et al. is: 1) is based on data not located within the vicinity of the proposed project (i.e., not within the same counties or geographic area which may define a particular Houston toad population; and 2) the information is based on abundance estimates from the GLR which is a supplemented Houston toad population. Therefore, the density of Houston toads on the GLR would likely be greater than the density in Colorado and Lavaca Counties where Houston toad habitat exists.

We also considered that the GLR and Bastrop County population has fluctuated between 2010 and present due to catastrophic droughts, floods, and stand replacing fires. Therefore, based on published information in Duarte et al., and current detection numbers on the GLR (i.e., detections as of 2019 are up to 190 for the year), we believe the GLR population estimate in Duarte et al. (2011) to be comparable to current GLR numbers but greater than in the action area. The anticipated amount of take for the Houston toad in Table 2 is based on the 0.050 calculated density. We use the 0.050 density due to the likelihood of the value being greater (i.e. based on a supplemented population) than the density of Houston toads within Colorado and Lavaca counties (i.e. not supplemented). Although the anticipated amount of take is still likely an overestimate, using the 0.050 value may be closer to realistic densities within the action area and reduces the risk of overestimating take. Table 2 expresses the authorized take amount of Houston toad individuals, and also shows the amount of acreage upon which take calculations are based.

Table 4. Anticipated take for the Houston toad.

Project Area	Amount habitat loss or degradation in acres	Life stage take is anticipated	Amount of Take of individuals	Type of Take	Take Anticipated as Result of
In USACE Action Area	73.6 acres habitat loss	Adult	4	Lethal	Kill or injure due to pipeline construction activities
		Juvenile	All present		
	578.9 acres habitat degradation	Adult	29	Harm	Reduction of fitness to individuals by impairing breeding, feeding, and sheltering caused by loss and degradation of habitat
		Juvenile	All present		
In Applicant Action Area	79.0 acres habitat loss	Adult	4	Lethal	Kill or injure due to pipeline construction activities
		Juvenile	All present		
	714.4 acres habitat degradation	Adult	36	Harm	Reduction of fitness to individuals by impairing breeding, feeding, and sheltering caused by loss and degradation of habitat
		Juvenile	All present		

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service has determined that this level of anticipated take is not likely to jeopardize the continued existence of the golden-cheeked warbler and Houston toad taking into consideration the status of those species, the degree of impact to the species cause by the proposed pipeline, and considering the conservation measures for the conservation of these species to which the Applicant has committed.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize incidental take of the golden-cheeked warbler and Houston toad. The USACE and/or the Applicant, as applicable, shall:

1. USACE shall minimize harm of the GCWA and Houston toad during activities associated with their NWP 12 authorization of the PHP.
2. The Applicant shall minimize the impacts, i.e. the amount or extent of incidental take, to the GCWA and Houston toad, during activities associated with the construction and operation of the PHP.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the Act, USACE and/or the Applicant, as applicable, must comply with the following terms and conditions that implement the reasonable and prudent measure described above and outlined reporting/monitoring requirements. The Corps and/or the Applicant, as applicable, must implement the terms and conditions for all project activities in the USACE Action Area, while the Applicant has responsibility for implementing the terms and conditions for all project activities in the Applicant Action Area. These terms and conditions are non-discretionary. The following terms and conditions implement reasonable and prudent measure 1:

1. All personnel involved in any authorized activity covered by the biological opinion shall be informed of these terms and conditions prior to the implementation of the authorized activity.
2. Within GCWA habitat in USACE Action Area, vegetation clearing shall not occur from March 1 to July 31. Vegetation clearing within defined project workspaces shall be cleared prior to March 1. Construction shall occur immediately after clearing to effectively be continuous, and minimize disturbance to nesting GCWA.
3. All conservation measures described within the BA dated August 2019, and this BO shall be fully implemented. The Corps shall ensure conservation measures are implemented within the defined USACE Action Area as long as the duration of federal involvement or control over the action is retained or authorized by law.
4. Temporary fill, construction material, or other debris shall be removed immediately after completion of activities covered by the biological opinion that result in alteration of GCWA or Houston toad habitat.
5. The USACE shall comply with the reasonable and prudent measures described above and the required reporting and monitoring requirements below to ensure the amount of authorized take is not exceeded.

The following terms and conditions implement reasonable and prudent measure 2:

1. All personnel implementing the Applicant's authorized activity covered by the biological opinion shall be informed of these terms and conditions prior to the implementation of the authorized activity.

2. Within GCWA habitat occurring in the Applicant Action Area, vegetation clearing shall not occur from March 1 to July 31. Vegetation clearing within defined project workspaces shall be cleared prior GCWA arrival with construction occurring immediately after to effectively be continuous, and minimizing disturbance to nesting GCWA.
3. All conservation measures described within the BA dated August 2019, and this BO shall be fully implemented. The Applicant's donation of the Igau Ranch to the Balcones Canyonlands National Wildlife Refuge will occur with six months of the date of the biological opinion.
4. The Applicant shall prepare of list of local veterinarians capable of handling injured Houston toads. The list shall include veterinarian contact information and will be kept onsite.
5. After completion of activities covered by the biological opinion that result in habitat alteration, any temporary fill, construction material, or other debris shall be removed.
6. The Applicant shall comply with the reporting requirements below.
7. The Applicant shall implement all conservation measures described within the BA dated August 2019, and the BO to the full extent. This includes the Applicant's offsets for
8. impacts of take to the GCWA and Houston toad within defined USACE and Applicant Action Areas. This condition shall apply whether discretionary federal involvement or control over the action has been retained or is authorized by law, and after the USACE discretionary federal involvement has ceased.
9. Any failure by the Applicant to comply with the terms and conditions stated herein will result in loss of Section 9 take coverage for activities occurring outside of the Corps' jurisdiction, if not remedied within a reasonable period of time to the satisfaction of the Service.

MONITORING AND REPORTING REQUIREMENTS

Upon locating a dead, injured, or sick GCWA or Houston toad, prompt notification must be made to the nearest Service Law Enforcement Office (San Antonio, TX; telephone: 210-681-8419), the Austin Ecological Services Field Office (telephone: 512-490-0057), and the Texas Coastal Ecological Services Field Office (telephone: 281-286-8282). Care should be taken in handling sick or injured specimens to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered specimens or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

Upon completion of the project, a post-activity report prepared by the Applicant in coordination with the USACE shall be forwarded to the field supervisor, Austin Ecological Services Field Office, within 60 calendar days. This report shall detail: (1) dates that activities occurred; (2) pertinent information concerning the completion of and success in implementing the conservation measures; (3) an explanation of failure to meet such measures, if any; (4) occurrences of listed species encountered during project implementation and project effects, if any; (5) occurrences of incidental take of species listed pursuant to the Act, if any; and (6) other pertinent information.

The Austin Ecological Services Field Office and Texas Coastal Ecological Services Field Office is to be notified by USACE or the Applicant within three working days of the finding of any dead listed species or any unanticipated harm to the species addressed in the biological opinion.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered or threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to help implement recovery plans, or to develop information. The Service recommends the following conservation measures:

1. Assist the Service in the implementation of the GCWA Recovery Plan and the Houston Toad Recovery Plan.
2. Assist the Service in identifying potential conservation land that could be acquired for Houston toad conservation.
3. In partnership with the Service, develop guidelines for other permitted pipeline projects that will reduce adverse effects of routine projects on listed species and their habitats. Such actions may contribute to the delisting and recovery of listed species by preventing degradation of existing habitat and increasing the stability of suitable habitat.
4. Evaluate short and long-term effects to GCWA, Houston toad, and TFHC for similar authorized pipeline projects occurring in the urban-wildland interface. Efforts may include, but are not limited to, evaluating the effects of habitat, loss, modification, and fragmentation on these species.]
5. Conduct GCWA and Houston presence/absence surveys 10 years following the completion of pipeline construction to provide data in these species' ranges affected by the PHP.
6. Locate and negotiate agreements with property owners whose properties are suitable for planting translocated Tobusch fishhook cacti.

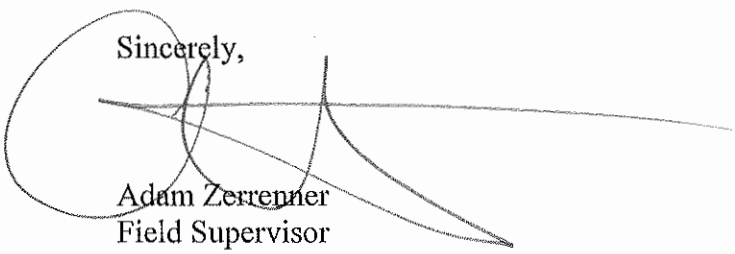
For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the PHP within the U.S. Army Corps of Engineers Fort Worth District (SWF-2018-00227) and Galveston District (SWG-2018-00737). As provided in 50 CFR Sec 402.16, reinitiation of consultation is required and shall be requested by the federal agency or by the Service, where discretionary federal involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of incidental taking specified in the incidental take statement is exceeded; (2) if new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or an extent not previously considered; (3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or designated critical habitat not considered in the biological opinion or written concurrence; or (4) if a new species is listed or designated critical habitat that may be affected by the identified action.

If you have questions regarding this biological opinion, please contact Jacob Ogdee, at 512-490-0057, ext. 243, or at jacob_ogdee@fws.gov.

Sincerely,



Adam Zerrenner
Field Supervisor

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